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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 10
MAY 15, 1978

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U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESEARCH AND TECHNOLOGY

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 10
MAY 15, 1978

W78-04201 – W78-04700

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

A THREE-DIMENSIONAL TURBULENT ENERGY MODEL FOR NONHOMOGENEOUS ESTUARIES AND COASTAL SEA SYSTEMS,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W78-04343

2B. Precipitation

ACCIDENTAL AND PLANNED WEATHER MODIFICATION IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W78-04205

PRECIPITABLE WATER OVER THE UNITED STATES, VOLUME I: MONTHLY MEANS,
National Weather Service, Silver Spring, MD. Office of Hydrology.
G. A. Lott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 219, Price codes: A09 in paper copy, A01 in microfiche. NOAA Technical Report NWS 20, November 1976. 177 p, 11 fig, 4 tab, 13 ref.

Descriptors: *Precipitable water, *United States, *Precipitation(Atmospheric), Cloud physics, Moisture content, Atmosphere, Water vapor, Meteoric water, Rainfall, Monthly, Data collections, Climatology, Meteorology, Monthly means.

Mean monthly values of precipitable water were presented in tabular and graphical form for all radiosonde stations in the contiguous United States for the period 1946-72 and for Alaska 1950-69. The precipitable water was given by layers from the surface to 400 mb from twice-daily observations. (Sims-ISWS)
W78-04218

AGROMETEOROLOGICAL STUDIES IN THE TURKMEN SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
A. P. Fedoseev, and K. Artykov.
Probl Osvoeniya Pustyn'. 4, p 31-35, 1974.

Descriptors: *Agrometeorological studies, Shrubs, *Turkmen-SSR, USSR, *Model studies, *Climates, Mathematical models, Biophysical models.

An estimation of the climatic resources of the Turkmen SSR (USSR) aimed at raising the efficiency of agriculture was made. The principles of long-range agrometeorological forecasts of range yield capacity (6-mo. forecast for herbaceous plants and 8-9 mo. forecasts for shrubs and semishrubs) were developed. The theoretical basis of the investigations should be applied to mathematical and biophysical modeling of agrometeorological processes.--Copyright 1975, Biological Abstracts, Inc.
W78-04241

THE DEVELOPMENT OF METEOROLOGICAL STUDIES IN THE TURKMEN SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
N. S. Orlovskii, and E. K. Balakirev.
Probl Osvoeniya Pustyn'. 4, p26-30, 1974.

Descriptors: Fig, Land, Meteorological data, Olive, Pomegranate, Rubber, *Turkmen-SSR, USSR, Vegetation, *Climatic data, *Crops, Networks.

The 1st meteorological station in Turkmenistan (USSR) was organized in 1869. Today there are 56 stations and 44 meteorological posts which provide comprehensive climatic information. (Subtropical crops (fig, olive, pomegranate, rubber); range land vegetation are discussed.)--Copyright 1975, Biological Abstracts, Inc.
W78-04242

THE DETERMINATION OF REGIONAL EVAPOTRANSPIRATION BY MEANS OF STANDARD METEOROLOGICAL DATA,
Cornell University Ithaca, New York, School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2D.
W78-04372

SIMULATION OF DESIGN-STORMS WITH PROBABLE DISTRIBUTIONS IN TIME AND SPACE FOR STORM DRAINAGE SYSTEMS,
Technische Univ., Hanover (West Germany), Inst. fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
F. Sieker.
Progress in Water Technology, Vol 9, No 3, p 509-519, 1977. 3 fig, 1 ref.

Descriptors: *Design storm, *Distribution, *Statistical methods, *Storm drains, *Probability, Meteorological data, Rain gages, Analytical techniques, Methodolgy, Simulated rainfall, Probability, Equations, Model studies, *Variance analysis, Simulation equations, Normal distribution.

In case of hydraulic computation of storm drainage systems the postulate: 'frequency of rain is equal to frequency of discharge' is established. In order to ensure this postulate, design storms with probable distributions in time and space ought to be used. A method used to obtain such a design storm was described. The computation was based on the statistical method of variance analysis. The probable distribution in time was simulated by a model of twofold variance analysis, and the probable distribution in space by a model of a threefold one. All terms of the simulation equations represent statistical regularities which can be interpreted in regard to their physical sense. The probable distributions were given by arithmetic addition of those terms. The application of the method was shown by examples. (Singh-ISWS)
W78-04511

PATH- AND AREA-INTEGRATED RAINFALL MEASUREMENT BY MICROWAVE ATTENUATION IN THE 1-3 CM BAND,
National Center for Atmospheric Research, Boulder, CO.
D. Atlas, and C. W. Ulbrich.
Journal of Applied Meteorology, Vol. 16, No. 12, p 1322-1331, December 1977. 6 fig, 4 tab, 29 ref.

Descriptors: *Remote sensing, *Rainfall, *Radar, Microwaves, Attenuation, Rainfall intensity, Measurement, Correlation analysis, Regression analysis, Raindrops, Meteorology, Electrical engineering, *Microwave attenuation.

The reasons for linear relationship between microwave attenuation A and rainfall rate R near 1 cm wavelength were explained. This linearity also implies independence of the A-R relationship from the drop size distribution, thus making attenuation measurements near this wavelength attractive for path-averaged rainfall. Regression equations of the form A = KR to the alpha power were calculated for 4 radar wavelengths from 0.86 to 3.2 cm from drop size spectra. As predicted, alpha increases from about 1.04 to 1.16, and average errors of estimate of R from the regression equations increase from about 9 to 21% from 0.86 to 3.2 cm, respectively. The larger errors at 3.2 cm reflect the increased dependence on the form of the drop size distribution. Even at 3.2 cm, the errors are typically less than half those incurred from the use of reflectivity factor Z and a priori Z-R relations. Various methods of measuring path- and area-averaged R were studied. Radar methods using standard targets fail over 30 km paths at wavelengths of 0.86 and 1.25 cm at mean R greater than about 9 and 20 mm/h respectively, because of excessive attenuation but are operative to larger mean rates at 1.78 and 3.2 cm. One-way methods between transmitter and receiver are the most suitable in terms of maximum measurable mean R. A wavelength between 1.5 and 2 cm provides a reasonable compromise between maximum measurable mean R and minimum errors. (Sims-ISWS)
W78-04530

2C. Snow, Ice, and Frost

SNOTEL: MONITORING CLIMATIC FACTORS TO PREDICT WATER SUPPLIES,
Soil Conservation Service, Portland, OR. West Technical Service Center.
For primary bibliographic entry see Field 7B.
W78-04213

CENTRAL AVALANCHE HAZARD FORECASTING- INTERIM REPORT, PHASE II,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
E. R. LaChapelle, R. T. Marriott, M. B. Moore, F. W. Reanier, and E. M. Sackett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 825, Price codes: A05 in paper copy, A01 in microfiche. Washington State Highway Department Research Report 23.2, June 1976. 86 p, 15 fig, 7 tab, 8 ref, 3 append.

Descriptors: *Avalanches, *Snowpacks, *Washington, *Forecasting, Snow, Highways, Hazards, Snow management, Mountains, Weather, Safety, Warning systems, *Avalanche forecasting.

This report summarized the first year of activity under Washington State Department of Highways project Central Avalanche Hazard Forecasting (Agreement Y-1700) to test the feasibility and effectiveness of central avalanche forecasting for the Cascade Mountain Passes and adjacent territory. This project explores the possibilities of improving both mountain weather and related avalanche forecasts for use by the WSDH during winter operations in the mountain passes and, secondarily, explores the usefulness of an area-wide forecasting service to other cooperating agencies. The eventual aim of this work is to establish the technical and administrative framework for an operational, on-going mountain weather and avalanche forecasting service for Western Washington under the joint support of interested public agencies. (Sims-ISWS)
W78-04219

WATER FLOW THROUGH VEINS IN ICE,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
S. C. Colbeck.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 631, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-6, April 1976. 8 p, 8 ref.

Descriptors: *Glaciers, Water, *Flow, Model studies, Mathematical models, Snow cover, Snowpacks, Ice, Melting, Flow rates, Permeability, Pores, Porosity, Runoff, Glaciology, *Ice veins.

Water flow through the vein structure of temperate ice was described as Darcian flow, in which the pressure gradient is determined from vein size

and overburden pressure. A solution method for the resulting equation was given, and two special cases were considered. For steady flow, the equilibrium vein size is a function of depth; and, by neglecting the effects of diffusion, it was shown that flow perturbations introduced at the surface propagate downward at a constant speed. These perturbations propagate so slowly that even annual surface fluctuations of flow may be eliminated by diffusion before reaching the bottom of the glacier. (Sims-ISWS)
W78-04221

CHEMICAL COMPOSITION OF SNOW ON THE WATER SURFACE OF THE KAMA AND VOTKINSK RESERVOIRS,
Perm State Univ. (USSR). Lab. of Water Management Research.
N. A. Pecherkin, and E. A. Burmatova.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 422, Price codes: A02 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 611, March 1977. 8 p, 3 tab, 13 ref. Translated from Gidrokhimicheskie Materialy, Vol 39, 7 p, 1965.

Descriptors: *Snow, *Chemical analysis, *Reservoirs, Water quality, Chemistry of precipitation, Precipitation(Atmospheric), Salts, Air pollution, Pollutants, Water pollution sources, Path of pollutants, Pollutant identification, *USSR, Snow mineralization.

This article reported findings from an investigation of snow on the water surface of the Kama and Votkinsk reservoir. The investigation was conducted in the winter of 1961-63. The chemical composition of the sample was determined by the technique of Ye. S. Burkser, N.Ye. Fedorova and B.B. Zaydis. Observations made on these reservoirs made possible a rough calculation of the amount of salt and other chemicals arriving on the water surface. (Sims-ISWS)
W78-04222

EFFECTS OF RADIATION PENETRATION ON SNOWMELT RUNOFF HYDROGRAPHS,
Army Terrestial Sciences Center, Hanover, NH. Snow and Ice Branch.
S. C. Colbeck.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 763, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-11, April 1976. 14 p, 4 fig, 2 tab, 10 ref.

Descriptors: *Snow, *Snowmelt, *Melting, *Radiation, *Solar radiation, Effects, Model studies, Mathematical models, Runoff, Flow, Melt water, Hydrology, *Radiation absorption(Snow).

Water flow through the unsaturated portion of a snowpack was calculated using various assumptions about radiation penetration into the snow. The results showed that for the purposes of hydrologic forecasting, it is sufficiently accurate to assume that all of the radiation Absorption occurs at the surface. The error in the calculation of flow is largest for very shallow snowpacks, but the error is reduced by radiation absorption at the base of the snow and by the routing of meltwater through the saturated basal layer. (Sims-ISWS)
W78-04223

GROUNDED ICE IN THE FAST ICE ZONE ALONG THE BEAUFORT SEA COAST OF ALASKA,
Army Terrestrial Sciences Center, Hanover, NH.
A. Kovacs.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 352, Price codes: A03 in paper copy, A01 in microfiche. CRREL Report 76-32, September 1976. 26 p, 22 fig, 1 tab, 13 ref. NOAA-01-5-022-1651.

Descriptors: *Ice, *Coasts, *Sea ice, *Alaska, *Arctic, Remote sensing, Aerial photography, Satellites(Artificial), On-Site investigations, Movement, Measurement, Surveys, Cold regions, *Beaufort Sea, *Prudhoe Bay(Alaska), *Harrison Bay(Alaska), Grounded ice, Roughness, Thickness, Ice islands.

Four large grounded multi-year shear ridge formations were found in the grounded ice subzone of the fast ice zone near the Harrison Bay/Prudhoe Bay area of Alaska. A 166-m-long cross section of one of these formations was obtained by leveling and sonar measurements. These measurements revealed that the maximum ridge height was 12.6 m and that the formation was grounded in 17-18 m of water. The salinity, temperature, brine volume, and density of the ice were determined on samples obtained by coring. The physical characteristics of the formations as observed in satellite, SLAR, and aerial imagery indicated that these formations have not moved between the time of their formation in the fall of 1974 and August of 1976. Evidence of significant aeolian debris discoloring the ice was discussed. (Sims-ISWS)
W78-04224

GROWTH HISTORY OF LAKE ICE IN RELATION TO ITS STRATIGRAPHIC, CRYSTALLINE AND MECHANICAL STRUCTURE,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
A. J. Gow, and D. Langston.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 228, Price codes: A03 in paper copy, A01 in microfiche. CRREL Report 77-1, January 1977. 29 p, 22 fig, 9 ref.

Descriptors: *Lake ice, *Ice cover, *Lakes, *New Hampshire, Growth rates, Temperature, Winds, Stratigraphy, Structure, Crystals, Crystallography, Electrical conductance, On-site investigations, Laboratory tests, Ice, Physical properties, Mechanical properties.

Studies of the growth history and structural characteristics of winter ice covers on two New Hampshire lakes were described. The investigations included measurements of ice cover thickness, characterization of the stratigraphic and crystalline structure of the ice, identification and classification of major ice types, and measurements of electrolytic conductivity. The formation of cracks and flaws in the ice and their effects on the mechanical properties of the ice also were investigated measurement was described, and the interrelationships of the various physical and mechanical properties of temperate lake ice covers were discussed. (Sims-ISWS)
W78-04225

ARCHING OF MODEL ICE FLOES: EFFECT OF MIXTURE VARIATION ON TWO BLOCK SIZES,
Army Terrestrial Sciences Center, Hanover, NH. Applied Research Branch.
D. J. Calkins, and G. D. Ashton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 841, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-42, November 1976. 15 p, 8 fig, 5 ref, 1 append.

Descriptors: *Ice jams, *Rivers, *Laboratory tests, *Model studies, Ice, Navigation, Mathematical models, Ice loads, Hydraulic structures, Hydraulics, Ice booms, Hydraulic models, Floating ice, Ice bridging, Ice blocks, Ice floes.

A study of arching of mixed, square fragmented ice floes at an opening in an ice boom was documented, using results from a model study in which two sizes of plastic blocks represented real ice. A power function, relating the upstream ice concentration to the ratio of a characteristic block dimension to the gap opening, was found adequate to distinguish between arching and nonarching events for block mixtures of two component sizes. It was demonstrated that when the respective total areas of the two block components are nearly equal, a minimum ice concentration initiates an arch across the opening. As the mixture of two sizes of blocks approaches a uniform (one-sized) mixture, a higher concentration of ice is needed to initiate the arch. When the ratio of the block dimension to the gap opening is equal to or less than 0.10, arching of the fragmented ice is not possible, even when the upstream ice discharge exceeds the maximum discharge of ice through a gap opening. The distribution of fragmented ice areas is an important parameter in establishing the minimum size of opening at which an ice boom will retain its arching capability. (Sims-ISWS)
W78-04226

WINTER THERMAL STRUCTURE AND ICE CONDITIONS ON LAKE CHAMPLAIN, VERMONT,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
R. E. Bates.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 146, Price codes: A03 in paper copy, A01 in microfiche. CRREL Report 76-13, June 1976. 29 p, 17 fig, 4 tab, 9 ref.

Descriptors: *Ice, *Thermal properties, *Lake ice, *Vermont, Lakes, Freshwater, Ice cover, On-site investigations, On-site data collections, Instrumentation, Temperature, Air temperature, Water temperature, Weather, Winds, Climatological data, Meteorology, *Lake Champlain(VT), Shelburne Point(Vt), *St. Albans Bay(Vt), Ice thickness, Ice formation, Thermistors, Bubble systems.

The thermal structure and ice conditions of Lake Champlain, a mid-latitude large lake, near Shelburne Point, Vermont, were studied during the winter of 1974-75. The lake was instrumented to a depth of 8.5 m with a string of highly calibrated thermistors and connected to a data logger on shore which recorded water temperatures every four hours. An ice mooring system was developed to anchor the thermistor string so that ice and water temperatures could be obtained at known levels. This temperature recording system measured vertical and horizontal variations in ice and water temperature regimes during ice formation, Growth, and decay. Meteorological data were measured during the winter period November 1974 through March 1975 at the site. Ice stratigraphy was determined for the ice at the site at its maximum seasonal growth for comparison with ice from St. Albans Bay (at the northern end of Lake Champlain) which had formed earlier. Correlations were determined between ice growth and accumulated degree days of freezing. The operation of a bubbler system installed near the measurement site around a service dock was observed. (Sims-ISWS)
W78-04227

THERMODYNAMIC DEFORMATION OF WET SNOW,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
S. C. Colbeck.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 830, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-44, November 1976. 13 p, 7 fig, 3 tab, 10 ref.

Descriptors: *Deformation, *Snow, *Rheology, *Thermodynamics, Model studies, Mathematical models, Heat flow, Heat transfer, Mass transfer, Particle shape, Ice, Freezing, Pressure, *Wet snow.

The deformation of wet snow was explained in terms of the thermodynamics of the three phases of water. When deformation by particle rearrangement is fully developed, deformation can occur most rapidly by melting at the particle contacts. The rate of deformation is highly sensitive to the stress level. A model of the hydrostatic deformation of wet snow was constructed, and examples of the deformation of wet snow were given for a variety of conditions. The results were in agreement with existing experimental evidence. The model accurately simulted the transient nature of the deformation and the effect of water content on the quasi-stable density of wet snow subjected to a constant stress. (Sims-ISWS)
W78-04228

ST. MARYS RIVER ICE BOOMS, DESIGN FORCE ESTIMATE AND FIELD MEASUREMENTS,
Army Terrestrial Sciences Center, Hanover, NH.
R. E. Perham.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 902, Price codes: A03 in paper copy, A01 in microfiche. CRREL Report 77-4, February 1977. 32 p, 19 fig, 8 tab, 13 ref, append.

Descriptors: *Ice loads, *Rivers, *Harbors, *Canada, On-site investigations, Design, Model studies, Mathematical models, Loads(Forces), Navigation, Ships, Ice, Freshwater, Engineering, Civil engineering, *Ice booms, Ontario, *St. Mary's River(Mich-Ontario), Winter river navigation, Inland waterways.

A set of two ice booms with a 250-ft (76-m)-wide navigation opening between them was designed to stabilize the ice cover in the harbor at Sault Ste. Marie, Michigan and Ontario, and to reduce the ice losses associated with winter navigation of ships on the St. Marys River. The forces-from natural effects on the ice cover were predicted using existing theory and physical data for the area. The forces in the boom structure resulting-from ice cover and boom interaction were estimated. When the ice booms were installed, force measurement systems were put into selected anchor cables. These systems were operated all winter in conjunction with a modest program of supplemental data gathering. The force data exhibited periods when the force distribution was in good agreement with predictions and periods when the effect of ice on the booms differed substantially from predictions. Sometimes passing ships had a substantial effect on the ice cover and the boom loads, and at other times, the effect was negligible. The direction of travel made little difference on average peak loads. The maximum loads on the booms resulted from natural occurrences. (Sims-ISWS)
W78-04233

REMOTE SENSING OF ACCUMULATED FRAZIL AND BRASH ICE IN THE ST. LAWRENCE RIVER,
Army Terrestrial Sciences Center, Hanover, NH. Applied Research Branch.
A. M. Dean, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 905, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 77-8, April 1977. 25 p, 15 fig, 2 tab, 7 ref.

Descriptors: *Remote sensing, *Ice, *St. Lawrence River, Instrumentation, Equipment, Aircraft, Radar, Cold regions, Rivers, Ice cover, Profiles, Maps, Mapping, Data collections, Data processing, Navigation, *Ice thickness, *Frazil ice, *Brash ice.

A broadbanded impulse radar system was used for aerial detection of accumulated frazil and brash ice in a 9.5-km reach of the St. Lawrence River near Ogden Island. The remote sensing and data reduction system developed for the project provided data sufficient for production of a contour map having 1-ft intervals. With this contour map, the accumulation pattern of frazil and brash ice could be analyzed. Recommendations were given for improving the performance of the aerial profiling system. (Sims-ISWS)
W78-04234

GROUNDWATER AND SURFACE WATER IN THE PERMAFROST REGION,
N. I. Tolstikhin, and O. N. Tolstikhin.
Water Resources Branch, Inland Waters Directorate, Fisheries and Environment Canada, Ottawa, Canada, Technical Bulletin No 97, 1977. 25 p., 11 fig, 3 tab, 22 ref.

Descriptors: *Groundwater, *Surface waters, *Permafrost, Springs, Ice, Freezing, Rivers, Lakes, Ponds, Free surfaces, *Suprapermafrost water, *Intrapermafrost water, *Subpermafrost water, Hydrolaccoliths, Icings.

The types of groundwater found in the permafrost region are discussed in detail: suprapermafrost water, intrapermafrost water and subpermafrost water. Also discussed is the emergence of groundwater on the surface in the form of springs, icings, pools of open water in ice, and hydrolaccoliths. Rivers and lakes in the permafrost region are described. (WATDOC)
W78-04352

ON MELTING ICEBERGS,
Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
H. E. Huppert, and J. S. Turner.
Nature, Vol. 271, No. 5640, p 46-48, January 1978. 5 fig, 5 ref.

Descriptors: *Melting, *Icebergs, *Laboratory tests, Water resources, Water supply, Salinity, Sea water, Freshwater, Melt water, Saline water-freshwater interfaces, Mixing, Circulation, Water circulation, Ice, Ice-water interfaces, Towed icebergs.

In several countries the feasibility of acquiring freshwater from icebergs is being studied. The icebergs would be towed to the coast and then melted. One suggestion for melting the iceberg is to run each iceberg aground in water approximately 250 m deep, the mean depth of Antarctic icebergs. A relatively shallow pen then would be built around the iceberg. It is conjectured that the melt water would rise, without much mixing, into the pen, from where it would be siphoned off for subsequent use. Neshyba claims, however, that melt water produced by icebergs may be responsible for a large amount of upwelling and mixing in the Antarctic's Weddell Sea. He asserts that as the melt water rises up the side of an iceberg, it entrains a sizeable quantity of warmer, saltier water from the environment. Neshyba calculates that an average-sized iceberg is responsible for a vertical volume transport into the upper layer of the Weddell Sea of 3.3 x 10 to the 8th power cu cm/s. This is a considerable transport, and the raising of water and nutrients from depth by this mechanism would be of importance in determining the physical and biological properties of the Weddell Sea. The first suggestion, that fresh melt water rises to the surface, and Neshyba's claims, that the melt water will have mixed significantly with its salty environment before reaching the surface, cannot both be correct. Laboratory tests showed both conjectures to be in error. (Sims-ISWS)
W78-04515

ICEBERG SOUNDING BY IMPULSE RADAR,
Memorial Univ. of Newfoundland, St. John's. Centre for Cold Ocean Resources Engineering.
J. R. Rossiter, and K. A. Gustajtis.
Nature, Vol. 271, No. 5640, p 48-50, January 1978. 3 fig, 8 ref.

Descriptors: *Remote sensing, *Icebergs, *Radar, Sounding, Measurements, Sampling, Ice, Foreign research, Aircraft, Instrumentation, On-site investigations, Cold regions, *Newfoundland.

Knowledge of an iceberg's draft is essential for assessing its risk to underwater installations, for predicting its drift, and for estimating its total bulk. Because of the highly irregular shape of icebergs, it is impossible to estimate an iceberg's draft directly from its above-water dimenstions. It was reported in this paper that estimates of the draft of irregularly-shaped icebergs also can be obtained from the air quickly and accurately using short-pulse radar. A small iceberg in Twillingate Harbout, Newfoundland (49 deg 40 min N, 54 deg, 46 min W), was sounded from a helicopter using impulse radar on 11 June 1977. The result was verified by simultaneous measurement of the iceberg's draft using side-scan sonar. (Sims-ISWS)
W78-04516

THE COMPOSITION OF BASAL ICE FROM A GLACIER SLIDING OVER LIMESTONES,
Stanford Univ., CA. Dept. of Applied Earth Sciences.
B. Hallet, R. Lorrain, and R. Souchez.
Geological Society of America Bulletin, Vol 89, No 1, p 314-320, January 1978. 4 fig, 1 tab, 30 ref. NSF GA-40497X.

Descriptors: *Glaciers, *Chemicals, *Limestones, Sampling, On-site investigations, On-site data collections, Chemical analysis, Calcium, Foreign countries, Magnesium, Foreign research, Sodium, Potassium, Calcium carbonate, Calcite, Chemical precipitation, Ice, Cores, Cations, Chemistry, Glaciology, *Tsanfleuron Glacier(Switzerland).

Samples of ice from the Tsanfleuron Glacier (Switzerland) were analyzed for Ca, Mg, Na, and K by atomic absorption. The basal ice is distinctly richer in Ca and Mg, but it is slightly poorer in Na and K than the overlying glacier ice. The relative enrichment of Ca and Mg in basal ice appears to result from the limited incorporation of solutes as the ice forms by refreezing of pressure meltwaters that have flowed in intimate contact with the carbonate bedrock underlying the glacier. Because the bulk of the solutes are selectively rejected by the growing ice, they tend to accumulate in freezing subglacial waters until they eventually precipitate in areas where basal freezing is localized. This subglacial precipitation of CaCO3 results in thin superficial coatings of calcite that are abundant and particularly well developed in small concavities of the bedrock surfaces recently exposed by the retreat of the Tsanfleuron Glacier. Calculated minimum solute concentrations required to maintain such CaCO3 precipitation used in conjunction with an experimentally determined effective distribution coefficient, which characterizes the solute partitioning during the growth, can yield estimates of the Ca content of the regelation ice. The close agreement obtained between predicted and measured Ca contents in basal ice strongly supports the hypothesis that ice layers at the base of the Tsanfleuron Glacier are formed, at least in part, by regelation and that the calcite deposits result from the selective solute rejection that accompanies basal ice growth. (Sims-ISWS)
W78-04518

DEVELOPMENT OF LARGE ICE SAWS,
Army Terrestrial Sciences Center, Hanover, NH.
D. E. Garfield, B. Hanamoto, and M. Mellor.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 899, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-47, December 1976. 17 p, 11 fig, 6 ref.

Descriptors: *Ice saws, *Ice, *Michigan, *Locks, Equipment, On-site investigations, Evaluation, Navigation, Ships, Canals, Engineering, Mechani-

cal engineering, *Sault Ste. Marie(Mich), Chain saws, Cutting tools, Ice removal, Lock walls.

This report described two mechanical ice-cutting systems for the removal of ice collars at the high pool level on the Poe Lock of the St. Marys Falls Canal at Sault Ste. Marie, Michigan. One system was a narrow-kerf (3-1/4-in-wide) coal-cutting chain saw mounted on a bar, driven by a 65-hp wheeled trencher. The other system was a lumber-cutting chain saw mounted on a bar, driven by a 30-hp wheeled soil trencher which cut a 0.56-in-wide kerf. The lumber-cutting saw's bar was too flexible, and the desired cutting traverse speed was not met. The coal-cutting saw cut 6-ft-deep ice collars at traverse speeds of up to 10 ft/min and is acceptable. With a few modifications, the coal-cutting saw would be operational. (Sims-ISWS)
W78-04531

2D. Evaporation and Transpiration

EFFECTS OF RADIATION PENETRATION ON SNOWMELT RUNOFF HYDROGRAPHS,
Army Terrestial Sciences Center, Hanover, NH. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W78-04223

THE DETERMINATION OF REGIONAL EVAPOTRANSPIRATION BY MEANS OF STANDARD METEOROLOGICAL DATA,
Cornell University Ithaca, New York, School of Civil and Environmental Engineering.
W. H. Brutsaert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 133, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, November 1977. 32 p, 7 fig, 34 ref, append. OWRT A-068-NY(1), 14-34-0001-7067,68.

Descriptors: *Evapotranspiration, Hydrological cycle, *Atmospheric boundary layer, Water balance, Meteorology, *Meteorological data, *Boundary layers, Heat transfer, Water vapor.

The investigation was concerned with the applicability of recently developed similarity methods for the parameterization of the atmospheric boundary layer to the determination of regional evapotranspiration by means of standard meteorological data. Previous results had shown that the modeling of surface water vapor transfer on the basis of boundary layer parameterization is feasible, only if a calibrated similarity function was used for water vapor. This meant that contrary to the common assumption, the transfer mechanisms of heat and water vapor in the atmospheric boundary layer are likely to be dissimilar. To test this and to obtain an unbiased determination of the water vapor function, an analysis was performed of data taken over the ocean during the AMTEX experiments of 1974 and 1975. Thus bulk transfer relationships were obtained for water vapor and sensible heat in the atmosphere for different interpretations of the thickness scale of the boundary layer. The results obtained for sensible heat are in good agreement with the results of previous studies in the literature. The results for water vapor confirmed that, under unstable atmospheric conditions, the bulk mass transfer coefficient is quite different from that for sensible heat. A convenient equation was derived from the data for practical application. A method is thus available for the direct use of the similarity formulation in hydrological and related engineering problems, while obviating the need for excessive local calibration.
W78-04372

DESICCATION AND CONSOLIDATION OF DREDGED MATERIALS,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 5G.
W78-04525

HYDROLOGY OF TWO SMALL WETLAND BASINS IN EASTERN MASSACHUSETTS,
Lowell Univ., MA. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2H.
W78-04539

2E. Streamflow and Runoff

HYDROLOGIC CONSIDERATIONS OF THE UPPER ST. JOHNS RIVER BASIN, FLORIDA,
Florida State Dept. of Environmental Regulation, Tallahassee.
W. J. McElroy.
Water Resources Bulletin, Vol. 13, No. 6, p 1153-1164, December 1977. 7 fig, 2 tab, 22 ref.

Descriptors: *Basins, *Rivers, *Flood plains, *Florida, Encroachment, Levees, Drainage, Watersheds(Basins), Storage capacity, Agriculture, Drainage districts, Flow, Water levels, Drainage effects, Drainage practices, Hydrology, *Upper St. Johns River basin(Fla).

Since the early 1900's, the Upper St. Johns River Basin, Florida, has been experiencing rapid agricultural development through reclamation of the low-lying marshland by organized drainage districts, private land owners, and corporations. These low-lying marsh areas, which constitute the floodplain, have been altered by the creation of levees, thereby reducing the natural storage capacity and permanently altering the regime of the system. This floodplain encroachment has resulted in both higher and lower water levels occurring in the upper basin area and in an increase in hydroperiod. This paper discussed the history and background of the basin accompanied by a hydrologic discussion and suggested recommendations for a water management plan that could improve the overall operation and management of the Upper St. Johns River basin. (Sims-ISWS)
W78-04204

RANGE, VELOCITY, AND MATERIAL FLUX OF COMPACTION FLOW IN GROWING SEDIMENTARY SEQUENCES,
Tuebingen Univ. (West Germany). Geologisch-Palaontologisches Inst.
For primary bibliographic entry see Field 2J.
W78-04209

FLOOD-FREQUENCY ANALYSIS FOR SMALL NATURAL STREAMS IN GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
H. G. Golden, and M. Price.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 113, Price codes: A05 in paper copy, A01 in microfiche. Open-file report 76-511, July 1976. 75 p, 14 fig, 13 tab, 35 ref.

Descriptors: *Flood forecasting, *Flood frequency, *Peak discharge, *Small watersheds, *Georgia, Analytical techniques, Flood data, Drainage area, Channel morphology, Rainfall-runoff relationships, Natural streams, Regression analysis, Model studies.

Flood information from 104 project basins (0.1 to 20 square miles) and data available from 170 larger basins (20 to 1,500 square miles) are analyzed to provide planners and designers with relations for estimating the magnitude and frequency of flood-peak discharges on small natural streams in Georgia. More than 90 percent of the project activity was directed toward the acquisition and processing of data for more than two thousand rainfall-runoff periods occurring during 1964-74 at the 104 project stations. Storm rainfall data were computed at 5-minute intervals from records of six long-term (about 75 years) National Weather Service Stations. The U.S. Geological Survey mathematical rainfall-runoff model is used to synthesize long-term flood records for about 80 percent of the project stations. Station flood-frequency data are developed, using the log-Pearson Type III distribution with regionalized skew coefficients. Multiple regression analysis is used to define relations between flood-frequency station data for small and large streams and 10 physical and climatological basin characteristics. The analysis indicates the drainage-basin size is the most significant variable. Five regions having distinct flood-peak characteristics are delineated. The developed relations, expressed as equations and nomographs, are considered usable for virtually any site in Georgia where the drainage area is between 0.1 and 20 square miles, and the flow is natural. (Woodard-USGS)
W78-04257

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 3, STATISTICS OF MEAN ANNUAL FLOW,
Department of the Environment, Ottawa, (Ontario). Water Resources Branch.
R. M. Leith.
Report Series No. 50, 1977, 40 p, 4 fig, 4 ref, 9 tab, 3 append.

Descriptors: *Streamflow, *Regional analysis, *Average, *Annual, Flow, Statistics, Precipitation(Atmospheric), *Canada, *British Columbia, Kootenay River, Kaslo, Columbia River, Quesnel River, Bakerville, Chilliwack River, Agassiz, Deviations.

Trends and serial correlations have been examined for series of annual flows and annual precipitations for 17 streamflow and 9 precipitation stations in British Columbia. This was undertaken to determine if there were statistically distinct trends in mean annual values which could bias regional analysis. No province-wide statistically distinct trends were found, although mean flows and precipitations were lower in the 1920's, 1930's, and 1940's than in the 1950's and 1960's. The maximum deviations of 5, 10, 15 year mean flows from 40 and 50 year mean flows were studied also to provide an indication of the extent to which short term means can differ from long term means. (WATDOC)
W78-04356

PREDICTING POLLUTANT DISPERSION IN RIVERS,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-04495

GRAVELLY FLOOD DEPOSITS OF IRVINE CREEK, ONTARIO, CANADA,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 2J.
W78-04503

THE SMALL SAMPLE ESTIMATION OF H,
Technical Univ. of Istanbul. (Turkey). Dept. of Hydraulics and Water Power.
Z. Sen.
Water Resources Research, Vol. 13, No. 6, p 971-974, December 1977. 1 fig, 3 tab, 11 ref.

Descriptors: *Hydrology, *Model studies, *Mathematical models, Markov processes, Monte Carlo method, Mathematics, Equations, Statistics, Regression anaiysis, Analytical techniques, Computer models, Streamflow, *Small sample estimation, Normal independent processes.

A general analytical procedure was presented for evaluating the expected value of the Hurst coeffi-

cient, h, in small samples. In particular, the expectation of h was derived analytically in an explicit form for the lag 1 Markov process, and then the validity of this analytical expression was checked against the results obtained by Monte Carlo simulation techniques. To this end, a large number of synthetic sequences were generated for various values of sample sizes, n, and the lag 1 serial correlation coefficient, rho, with the assumption that the underlying random variables are distributed normally. Furthermore, it was shown that the bias in rho for small samples is accentuated in the expected value of h which is a function of both n and rho only. (Sims-ISWS)
W78-04526

2F. Groundwater

SURFACE WATER-ESKER RECHARGE STUDY EAST LANSING-MERIDIAN TOWNSHIP, MICHIGAN,
Williams and Works, Grand Rapids, MI.
For primary bibliographic entry see Field 4B.
W78-04208

GROUND-WATER APPRAISAL OF THE PINE-LAND SANDS AREA, CENTRAL MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04246

THE EFFECT OF THE FAKA UNION CANAL SYSTEM ON WATER LEVELS IN THE FAKAHATCHEE STRAND, COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04249

A DIGITAL MODEL OF THE FLORIDAN AQUIFER, NORTH OF TAMPA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
A. F. Robertson, and M. J. Mallory.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 315, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 77-64, October 1977. 29 p, 14 fig, 1 tab, 14 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Potentiometric level, *Transmissivity, *Model studies, Analytical techniques, Data collections, *Florida, Forecasting, Evaluation, Groundwater resources, West-central Florida area, Floridan aquifer.

A regional ground-water model of the Floridan aquifer was constructed for an 875-square-mile portion of the rapidly developing area north of Tampa Bay. The digital model was calibrated by comparing observed (March 1974 and May 1975) and computed potentiometric heads. A good comparison was obtained by adjusting leakance and transmissivity. Differences between the computed and measured potentiometric surface were generally less than 3 feet, with a maximum error of 15 feet. The calibrated model may be used as a predictive tool. For example, the model could be used to evaluate the regional effects of increased ground-water withdrawal on the Florida aquifer. (Woodard-USGS)
W78-04251

GROUND-WATER BASIC DATA FOR MORTON COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04252

GROUND-WATER RESOURCES OF GRIGGS AND STEELE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04253

GROUND-WATER RESOURCES OF CAVALIER AND PEMBINA COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04254

GROUND-WATER LEVELS IN THE UNITED STATES, 1973-74. NORTHEASTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04255

GEOHYDROLOGY OF NORTH EASTERN PROVINCE, KENYA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04256

SUMMARY OF BASIC HYDROLOGIC DATA COLLECTED AT COSO HOT SPRINGS, INYO COUNTY, CALIFORNIA,
Geological Survey, Luguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04258

GEOLOGY AND WATER RESOURCES OF THE NORTHERN PART OF THE JUDITH BASIN, MONTANA,
Geological Survey, Billings, MT. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04263

APPROXIMATE AREAS OF RECHARGE TO THE CHICOT AND EVANGELINE AQUIFER SYSTEM IN THE HOUSTON-GALVESTON AREA, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04264

WATER-LEVEL CHANGES IN THE NORTHERN HIGH PLAINS OF COLORADO, 1964 TO 1976 AND 1972 TO 1976,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04265

NWWA RESEARCH FACILITY: AN OVERVIEW.
For primary bibliographic entry see Field 4B.
W78-04289

A LOOK AT GROUND WATER RESEARCH.
Water Well Journal, Vol 32, No 2, p 39-42, February, 1978.

Descriptors: *Groundwater, *Research facilities, *Tracers, Bromide ion, Resistivity, Plastic pipes, Well casings, Saline water intrusion, Water pollution sources, Water wells, Pollutants, Indicators.

1977 proved to be a productive year for ground water research in the U.S., and the increased amount of dollars available for such research in 1978 is a positive indication that progress will continue. Several of the more active ground water research centers in the nationa are described in this article, including the Auburn University Water Resources Research Institute, Pennsylvania State University, the Virginia Water Resources Research Center (Blacksburg), the Robert S. /Kerr Environmental Research Center, and Johnson Division, UOP. Recently completed studies and research in progress are reported for each of these centers. Of special interest is a discussion of Penn State's work with the bromide ion as a ground water tracer. (Eberle-NWWA)
W78-04290

REGIONAL GEOLOGY SERIES: PART 1, GLACIATED APPALACHIAN REGION,
National Water Well Association, Worthington, OH.
J. A. Hunt.
Water Well Journal, Vol. 32, No. 2, p 36-37, February, 1978, 1 fig.

Descriptors: *Groundwater, *Aquifers, *New England, *Northeast U.S., Drilling, Water supply, Water wells, Bedrock, Till, Glacial drift, Cracks, Joints(Geology), *Appalachian mountains region.

The concept of ten U. S. ground water provinces (as introduced by H. E. Thomas in 1952) has been a popular system for looking at large scale ground water conditions. The smallest of these regions, the Glaciated Appalachian, receives abundant rainfall and has rugged, hard rock terrain. Valleys are filled with sand and gravel outwash, and the entire area is irregularly blanketed with glacial till. This overburden is largely unsorted, and occasional large boulders can pose problems to drillers. Mud-rotary and cable-tool methods are usually chosen for drilling unconsolidated formations in this area; cable-tool and air hammer methods are commonly used in bedrock. The water that occurs in the bedrock is usually found in cracks and joints. The average domestic well provides about 5 gpm of generally good quality water. There are, however, many highly productive aquifers in surficial deposits of the region, and several major cities in this area obtain their water from permeable glacial deposits. Large diameter municipal and industrial wells are frequently expensive, requiring extensive test hole programs before a good site is located. (Eberle-NWWA)
W78-04291

NEWER TECHNIQUES AID SEARCH FOR GROUND WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 7B.
W78-04296

LIMITATIONS OF BANK-STORAGE MODEL ASSUMPTIONS,
Missouri Univ.- Columbia. Dept. of Geology.
J. M. Sharp, Jr.
Journal of Hydrology, Vol 35, No 1/2, p 31-47, October 1977. 14 fig, 1 tab, 26 ref. OWRT A-085-MO(3).

Descriptors: *Bank storage, *Mathematical models, *Surface-groundwater relationships, *Central U.S., *Alluvial aquifers, Hydraulic conductivity, Alluvium, Particle size, Depth, Dupuit-Forchheimer theory, Heterogeneity, Penetration, Flood plains, Meanders, Perched water, Digital computers, Computer models, Potentiometric level, Scour, Aquifers, Partial penetration, River stages.

Major alluvial aquifers in the central United States have certain common characteristics. Sediment mean grain size and hydraulic conductivity both increase with depth. Furthermore, most modern major rivers do not fully penetrate the alluvium. Examination of the common bank-storage model assumptions and comparison with major alluvial

aquifer hydrogeology indicated that many of the mentioned assumptions are questionable, and the resultant models may yield erroneous values. Common assumptions which do not correspond to observed data include the Dupuit-Forchheimer conditions and the assumptions of homogeneity, fully penetrating streams, and solely confined or unconfined systems. The limitations of bank-storage model assumptions must be understood clearly when attempting to understand hydrogeologic processes or in making decisions based on model output. (Visocky-ISWS)
W78-04335

HYDROGEOLOGY AND DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN NORTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
J. M. Sharp, Jr., R. F. Burmester, and O. Malvik.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 035, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, December 1, 1977. 65 p, 30 fig, 3 tab, 27 ref, 3 append. OWRT A-097-MO(1). 14-34-0001-7053 and 7054.

Descriptors: *Hydrogeology, *Aquifer characteristics, Bedrock, Saline water intrusion, Dissolved solids, *Missouri, Buried valleys, *Geophysical exploration, *Gravity geophysics, *Groundwater exploration.

Northwestern Missouri possesses a network of buried glacial or preglacial river valley aquifers. These aquifers represent the major ground-water resource in an otherwise relatively water poor area. Bedrock formations contain saline water of over 1000 ppm total dissolved solids. A multiple geophysical exploration program (involving gravity, seismic and electrical methods) was designed to delineate these aquifers. A gravity grid reconnaissance was made in the selected field area, and gravity residuals determined by polynomial trend surface analysis. A series of discontinuous residual lows generally correlate well with known bedrock lows. Seismic refraction gave accurate depths to bedrock in all areas, and confirmed that gravity residual lows in other areas represent bedrock lows. Electrical resistivity results were disappointing because adequate resistivity contrasts between the aquifers and bedrock were lacking. This is due to salt water encroachment from the bedrock. Some success was achieved in finding shallow aquifers. The multiple geophysical method appears feasible in northwestern Missouri, whereas any approach by itself is insufficient. A proposed ground-water exploration program is outlined.
W78-04496

APPLICATION OF THE DRILL-STEM TEST TO HYDROGEOLOGY,
Research Council of Alberta, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 8B.
W78-04508

CYCLIC STORAGE, WHERE ARE YOU NOW,
For primary bibliographic entry see Field 4B.
W78-04509

GROUND WATER AND VEGETATIONAL STRUCTURES, GROUND WATER COURSE COINCIDENCE METHOD AND VARIABILITY DIAGRAM IN CONTEXT OF ECOLOGICAL INVESTIGATIONS ON VEGETATIONAL UNITS AFFECTED BY GROUND WATER, NOVA ACTA LEOPOLDINA, VOL. 38, NO. 6, (IN GERMAN),
J. H. Scharf.
Johann Ambrosius Barth: Leipzig, East Germany 1973. 172 p.

Descriptors: *Ecological distribution, Forests, *Groundwater movement, Meadow, Methods, Variability, *Vegetation, *Water balance.

A brief explanation of objectives is given, followed by sections concerning the methods used, the 'catena principle,' parameters of water balance, the concept of ecological coindicence and ground water dynamics. An examination of the vegetational and hydrological data collected, its separation into forest, meadow and other vegetational categories and individual plants follows. The last 2 chapters include discussions of the methods and ecogeobotanical results, possible applications in plant cultivation and a general summary.--Copyright 1975, Biological Abstracts, Inc.
W78-04599

2G. Water In Soils

INFILTRATION FORMULA BASED ON SCS CURVE NUMBER,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, A. C. Miller, Jr, and D. F. Lakatos.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR4, Proceedings Paper 13427, p 419-427, December 1977. 3 fig, 4 tab, 9 ref.

Descriptors: *Infiltration, *Rainfall-runoff relationships, *Runoff, *Model studies, Soils, Storms, Urbanization, Equations, Curves, Permeability, Storage capacity, Soil water, Urban runoff, Cumulative curves, Differentiation.

A formula was developed for computing infiltration in rainfall-runoff simulations from published Soil Conservation Service (SCS) soils data. Cumulative infiltration was treated as the difference between cumulative rainfall and runoff. The SCS runoff formula then was differentiated with respect to precipitation to arrive at an infiltration rate with respect to rainfall increments rather than time as is used in most previous formulas. A numerical example was included, and 2 possible refinements were suggested which would involve additional computational labor but should improve the infiltration simulation. (Visocky-ISWS)
W78-04211

SOME REGULARITIES OF STATISTICAL DISTRIBUTION OF SOIL MOISTURE VALUES, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
E. A. Dmitriev, L. O. Karpachevskii, N. S. Oreshkina, L. D. Zakharina, and E. V. Shein.
Pochvovedenie 3, p 135-141, 1977.

Descriptors: *Soil moisture, *Distribution patterns, Soil texture, Cereal, Grass, Legume, Moscow, Tree, *USSR(Volgograd), Wilting.

Statistical distribution of moisture values in heavy-textured soils (covered by trees, legumes, grasses and cereals) (soddy-podzolic of the Moscow region Russian SFSR, USSR and light-chestnut of the Volgograd region) and coarse-textured soils (of the Volgograd region) was studied. The distribution observed the law of normal distribution when soil moisture ranged from maximum water capacity to wilting point. The distribution of moisture values reliably (with probability more than 0.95) differed from normal distribution when the soil was dried to wilting point. When the dry soil was irrigated or on the boundary of layers with different mechanical composition, the values were less reliable.--Copyright 1978, Biological Abstracts, Inc.
W78-04315

TRACING VERTICAL TRANSLOCATION OF SOIL MOISTURE,
Clemson Univ., SC. Dept. of Agricultural Engineering.
J. T. Ligon, T. V. Wilson, J. F. Allen, and U. P. Singh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY10, Proceedings Paper 13290, p 1147-1158, October 1977. 8 fig, 8 ref, 1 append. OWRT A-023-SC(8).

Descriptors: *Soil water movement, *Tracer studies, *Tritium, *South Carolina, Iodine, Iodine radioisotopes, Tracers, Radioisotopes, Diffusion, Soil water, Groundwater, Seepage, Soil moisture, Soils, Clays, Unsaturated flow, Dispersion, Drainage, Scintillation counters.

Tracer experiments using tritium tagged water were initiated during December 1972-January 1973 to determine the rate of downward displacement of water in unsaturated Piedmont profile. Tritium location was monitored by daily soil sampling immediately after injection of activity and at frequencies decreasing to once every 6 months after 1 yr. At the end of 23 months, the maximum level of activity was 24.8 ft (7.56 m). The observed rate of movement will bring the maximum tritium activity to the water table level of 65 ft (20 m) in about 6 yr. Under conditions at the research site, lateral displacement of the materials was negligible. Some detention of activity in the high-clay B-horizon of the soil was observed. (Sims-ISWS)
W78-04332

THE EFFECT OF SOIL MOISTURE ON RESISTANCE TO WIND EROSION, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Inst. of Mechanical Seismic Resistant Construction.
A. Azizov.
Pochvovedenie 1, p 102-105, 1977.

Descriptors: *Wind erosion(Soil), *Soil moisture, Air currents(Velocity).

A relationship was found between critical velocity and the air current producing the removal of soil paraticles and the moisture content in the upper soil layer. When soil moisture was less (or equal) than a certain ultimate value W. the effect of moisture was insufficient. If W > W the effect of moisture in removing soil particles was very strong. A semi-empirical formula was derived for determination of moisture contents which prevent the removal of soil particles.--Copyright 1978, Biological Abstracts, Inc.
W78-04337

HYDROLOGIC FACTORS AND ENVIRONMENTAL IMPACTS OF MASS SOIL MOVEMENTS IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 4D.
W78-04365

LAND DISPOSAL OF CHEMICAL SLUDGE,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W78-04371

ENVIRONMENTAL TRANSPORT MODELING OF POLLUTANTS IN WATER AND SOIL,
Oak Ridge National Lab., TN; and Union Carbide Corp., Oak Ridge, TN. Nuclear Div.
For primary bibliographic entry see Field 5B.
W78-04481

MOBILITY OF HEAVY METAL HUMATES IN SOILS AND SURFACE WATERS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.

W78-04494

MATHEMATICAL MODELING OF LAND RUNOFF CONTAMINATED BY PHOSPHORUS,
Marquette Univ., Milwaukee, WI.
For primary bibliographic entry see Field 5B.
W78-04507

SOIL WATER FLOW AND DISTRIBUTION IN HORIZONTAL AND VERTICAL DIRECTIONS AS INFLUENCED BY INTERMITTENT WATER APPLICATION,
Fruit and Fruit Technology Research Inst. Stellenbosch (South Africa).
I. Levin, and F. C. Van Rooyen.
Soil Science, Vol. 124, No. 6, p 355-365, December 1977. 7 fig, 4 tab, 11 ref.

Descriptors: *Soil water movement, *Infiltration, *Soil water, *Laboratory tests, Soil water, Soils, Sands, *Irrigation, Nutrients, Moisture content, Field capacity, Root zone, Aeration, Flow, Application methods, Agriculture, *Distribution patterns, Intermittent water application.

The flow and distribution of water in horizontal and vertical columns, using 2 soils of different texture, were investigated. The effect of continuous versus intermittent application of water to the soils was evaluated in terms of wetting front advance, cumulative infiltration, infiltration rate, and soil moisture content. In the vertical columns, using intermittent water application, the advance of the wetting front, the cumulative infiltration, and the infiltration rate were decreased and behaved as if the time-averaged water application rate were being applied continuously. This decrease also was found with the horizontal columns, but to a considerably smaller extent. In effect, this decrease would change the shape of the wetted soil volume in favor of the lateral direction when using point-source irrigation. The decrease in vertical water movement also can have favorable implications with respect to losses of water and nutrients beneath the root zone. By making use of intermittent water application, it also is possible to use high-discharge emitters while still obtaining low rates of water infiltration. In the medium-textured soil, the intermittent water application caused a significant decrease in soil moisture content in the transmission zone with both the vertical and horizontal columns. This implies improved aeration (reduced 'field capacity') when using intermittent water application in heavier textured soils. (Sims-ISWS)
W78-04528

THE FUNCTION OF DIFFERENT TYPES OF MACROPORES DURING SATURATED FLOW THROUGH FOUR SWELLING SOIL HORIZONS,
Soil Survey Inst., Wageningen (Netherlands). Dept. of Soil Physics.
J. Bouma, A. Jongerius, O. Boersma, A. Jager, and D. Schoonderbeek.
Soil Science Society of America Journal, Vol. 41, No. 5, p 945-950, September-October 1977. 6 fig, 2 tab, 23 references.

Descriptors: *Pores, *Pore water, *Saturated flow, *Soil water movement, *Soil horizons, Hydraulic conductivity, Physical properties, Soil structure, Soil texture, Tracers, Dye dispersion, Color, Voids, *Macropores, *Swelling soils, *Clay soils, Methylene blue, Pore-necks.

The hydraulic function of 3 types of macropores during saturated flow through 4 swelling fine clayey and very fine clayey soil horizons was characterized with methylene blue as a tracer and was quantified in large thin sections with the Quantimet 720. All 3 types of macropores, described as channels, vughs, and planar voids, contributed to flow. Distinction between 'smooth' and 'rough' ped faces in field structure descriptions proved meaningful for 3 soils with high linear extensibility values because vertical flow did not occur along interconnected planar voids adjacent to 'smooth' peds, whereas it did not occur along 'rough' peds. However, flow did occur along 'smooth' ped faces in the fourth soil, which had significantly lower extensibility values. Calculations of hydraulic conductivity K sub sat, based on the observed dye patterns, are difficult because the dye solution flowed in interrupted patterns along the walls of the macropores without apparently filling them, due to the occurrence of smaller pore 'necks' in overlying soil. But the number and percentages of colored pores for each of the three macropore-types showed (with one exception for planar voids) consistant differences among the four soils, which corresponded with differences in measured K sub sat values. (Visocky-ISWS)
W78-04529

THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 2L.
W78-04536

THE ROLE OF ALKALINE RESERVE IN MINERALIZATION OF ORGANIC SUBSTANCES. (IN RUSSIAN),
Miniskii Meditsinskii Inst. (USSR).
For primary bibliographic entry see Field 5G.
W78-04538

THE EFFECTS ON THE VEGETATION OF THE ADDITIONS OF INORGANIC NUTRIENTS TO SALT MARSH SOILS AT STIFFKEY, NORFOLK,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-04541

HEAVY METALS IN SEWAGE SLUDGE MAY MAKE IT UNSAFE FERTILIZER.
For primary bibliographic entry see Field 5E.
W78-04579

DECOMPOSITION OF SEWAGE SLUDGE COMPOST IN SOIL: I. CARBON AND NITROGEN TRANSFORMATION,
Agricultural Research Service, Beltsville, MD.
For primary bibliographic entry see Field 5E.
W78-04581

LAND APPLICATION GUIDELINES FOR SLUDGES CONTAMINATED WITH TOXIC ELEMENTS,
Northern Virginia Community Coll., Woodbridge. Div. of Environmental and Natural Sciences.
For primary bibliographic entry see Field 5E.
W78-04588

EFFECT OF FERTILIZERS AND COMBINED PLOWING ON THE PROTECTION OF SOD-PODZOLIC SOILS FROM EROSION, (IN RUSSIAN),
Central Inst. Agrochemistry Service, Moscow (USSR).
A. M. Gordeev, L. N. Tsurikov, and V. E. Tavtushenko.
Pochvovedenie 3, p 97-104, 1976.

Descriptors: Crops, Erosion, *Fertilizers, *Nutrients, Plowing, *Podzolic soils, *Soil erosion, Runoff, Sod, Soils, Winter, Cultivation.

Losses of nutrients on eroded soddy-podzolic soils under winter crops and on fall-plowed lands were determined. Mineral fertilizers applied before sowing winter crops and fall plowing considerably decreased the runoff and the loss of nutrients. A combined fall plowing on a slope reduced the nutrient losses from the soil.--Copyright 1976, Biological Abstracts, Inc.
W78-04598

SERVO CONTROLLED OPTIMIZATION OF NITRIFICATION-DENITRIFICATION OF WASTE WATER IN SOIL,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5E.
W78-04603

SLUDGE IMPROVES SANDY SOIL, INCREASES YIELDS WITHOUT POLLUTING.
For primary bibliographic entry see Field 5E.
W78-04608

APPLICATION OF SEWAGE SLUDGE TO GARDEN PLOTS,
Vermont Univ., Burlington. Dept. of Microbiology and Biochemistry.
For primary bibliographic entry see Field 5E.
W78-04613

A SIMPLE SOIL PERCOLATION TEST DEVICE FOR FIELD ENVIRONMENTALISTS,
Summit County Dept. of Environmental Health, Frisco, CO.
For primary bibliographic entry see Field 5A.
W78-04619

GROWTH OF LOBLOLLY PINE SEEDLINGS IN STRIP-MINED KAOLIN SPOIL AS INFLUENCED BY SEWAGE SLUDGE,
Southeastern Forest Experimental Station, Athens, GA. Inst. for Mycorrhizal Research and Development.
For primary bibliographic entry see Field 5E.
W78-04624

TRANSPORT OF HEAVY METALS IN A SLUDGE-TREATED FORESTED AREA,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-04653

FUSION METHOD FOR THE MEASUREMENT OF PLUTONIUM IN SOIL: SINGLE-LABORATORY EVALUATION OF INTERLABORATORY COLLABORATIVE TEST,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-04660

AIR CONTENTS IN SOILS ABOVE A HIGH WATER TABLE: APPLICATION TO DRAINAGE CLASSIFICATION OF SOILS,
Department of the Environment and Tourism, Charlottetown (Prince Edward Island). Div. of Soil Survey.
K. Michalica, M. A. Zwarich, and C. F. Shavkewich.
Can J Soil Sci. 53(3), p 325-330, 1973.

Descriptors: *Soil drainage, Classification, Drainage classification, *High water table, *Porosity(Soils).

Studies were conducted at 10 sites with a high water table with a view of classifying soil drainage status from a knowledge of water table depth and water retention properties of the soil. The parameter used to assess soil drainage status was air-filled porosity. The average error in predicting air-filled porosity in the field from water retention data was

2.3%. Air-filled porosity in the water retention samples could be predicted from soil components to within 3.4-5.9% of the actual value (on the average). This suggests that where water retention data are not available, a knowledge of soil components and water table depth may be sufficient to obtain an estimate of air-filled porosity. A system of soil drainage classification based on air-filled porosity is proposed.--Copyright 1974, Biological Abstracts, Inc.
W78-04670

IRON AND PHOSPHORUS INTERACTION IN CALCAREOUS SOILS: I. EFFECT ON GROWTH, PHOSPHORUS, AND IRON CONTENT OF PLANT,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
M. Omar, H. Hamdi, A. M. Elgala, and I. Wafik.
U A R J Soil Sci. 11(2), p 245-257, 1971.

Descriptors: *Calcareous soils, Chlorosis, Growth rates, *Iron, Moisture content, Nutrients, *Phosphorus, Plant physiology, Soils, Absorption, *Soil moisture, *Plant growth.

Three levels of soil moisture, 50% (M1), 100% (M2), and 150% (M3) of field capacity were maintained. Fe was applied in concentrations of 0 (Fe0), 1 (Fe1), 5 (Fe2) and 10 (Fe3) ppm Fe in soil. P was added at the rate of 0 (P0), 0.033 (P1), 0.066 (P2) and 0.132 (P3)g/pot. The aboveground parts of the corn plants were harvested 1 mo. from planting and the dry weight was recorded. The plant material was analyzed for total P, total Fe and in 1 N HCl-soluble 'active Fe.' Plants showed chlorotic symptoms, and severity of chlorosis was related to the P and soil moisture levels. Fe application to the soil did not prevent chlorosis development. Dry weight increased by increasing P and soil moisture levels. Plant P concentration increased by increasing the P application level. Neither of the combined application of P and Fe nor increasing moisture level had significant effect on plant Fe concentration. The plant P uptake was affected by P and moisture levels, but not with Fe treatments. The percentage and total active Fe decreased by increasing P level. The high level of soil moisture decreased the percentage of active Fe but increased the total active Fe as a function of dry matter increase.--Copyright 1973, Biological Abstracts, Inc.
W78-04671

DISTRIBUTION OF BEETLE MITES IN IRRIGATED SOILS, (IN RUSSIAN),
Odessa State Univ. (USSR).
For primary bibliographic entry see Field 3C.
W78-04673

AQUEOUS RELEASE OF HEAVY METALS FROM TWO SEWAGE SLUDGES,
Agricultural Research Service, Morgantown, WV. Plant Sciences Div.
For primary bibliographic entry see Field 5B.
W78-04677

2H. Lakes

RESERVOIR METALIMNION OXYGEN DEMANDS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04202

EFFECTS OF URBAN LAKES ON QUANTITY AND QUALITY OF BASEFLOW,
Wisconsin Univ.-Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W78-04206

THE CYCLICITY OF THE PROCESS OF CHANGES IN THE BIOMASS OF LAKE BAIKAL ZOOPLANKTON OVER MANY YEARS, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Univ. (USSR). Scientific Research Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-04212

DESIGN WAVE INFORMATION FOR THE GREAT LAKES, REPORT 3, LAKE MICHIGAN,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W78-04217

GROWTH HISTORY OF LAKE ICE IN RELATION TO ITS STRATIGRAPHIC, CRYSTALLINE AND MECHANICAL STRUCTURE,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W78-04225

WINTER THERMAL STRUCTURE AND ICE CONDITIONS ON LAKE CHAMPLAIN, VERMONT,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W78-04227

AN ERTS-1 INVESTIGATION FOR LAKE ONTARIO AND ITS BASIN,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
T. W. Wagner, and D. L. Rebel.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-28489, Price codes: A05 in paper copy, A01 in microfiche. NASA Contract Report ERIM 193300-65-F, July 1975. 95 p, 23 fig, 9 tab, 39 ref, append. NASA NAS5-21783.

Descriptors: *Lake Ontario, *Basins, *Watersheds(Basins), *Remote sensing, Data processing, Water resources, Runoff, Precipitation(Atmospheric), Water balance, Land use, Lakes, Forests, Vegetation, Drainage, Hydrology, Mathematical models, *LANDSAT, *ERTS-1.

This report documented a binational study of the techniques for applying ERTS and other types of remote sensor data to terrestrial hydrology. The study site was Lake Ontario's 34,000-sq-mi local drainage basin. Methods of manual, semi-automatic, and automatic (computer) data processing were evaluated, as were the requirements for spatial physiographic and limnological information. The coupling of specially processed ERTS data with simulation models of the watershed precipitation/runoff process provides potential for water resources management. Optimal and full use of the data requires a mix of data processing and analysis techniques, including single band editing, two band ratios, and multiband combinations. A combination of maximum likelihood ratio and near-IR/Red band ratio processing was found to be particularly useful. (Sims-ISWS)
W78-04230

APPLICATION OF REMOTE SENSING IN THE DETERMINATION OF WATER QUALITY IN NEBRASKA RESERVOIRS,
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 5A.
W78-04231

AUTOMATED GREAT LAKES WAVE FORECASTS,
National Weather Service, Silver Spring, MD. Techniques Development Lab.
N. A. Pore.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 854, Price codes: A02 in paper copy, A01 in microfiche. NOAA Technical Memorandum NWS TDL-63, February 1977. 15 p, 11 fig, 7 ref.

Descriptors: *Great Lakes, *Waves(Water), *Forecasting, Winds, Weather, Lakes, Storms, Mathematical models, Weather forecasting, Ships, Navigation, Meteorology, Limnology, *Wave forecasting.

The Techniques Development Laboratory of the National Weather Service began making automated wave forecasts for the Great Lakes in January 1975. These forecasts are based on specialized wind forecasts and the wave forecast method of Bretschneider. Possible fetch lengths are measured at 15 deg intervals and are adjusted for fetch width. Duration time is determined by examining the forecast wind directions for a 45 deg change. Forecasts of wave height are made twice daily and extend to 36 hr at 12-hr intervals. These forecasts are transmitted by teletypewriter and are used operationally by Weather Service Forecast Offices in the Great Lakes area. (Sims-ISWS)
W78-04235

SEASONAL DISTRIBUTION AND ABUNDANCE OF FISHES IN THE LITTORAL ZONE OF A MICHIGAN LAKE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station; and Michigan State Univ., Hickory Corners. Dept. of Zoology.
D. J. Hall, and E. E. Werner.
Transactions of the American Fisheries Society, Vol. 106, No. 6, 1977, p 545-555, 3 fig, 6 tab, 26 ref. NSF BMS 74-09013 A01.

Descriptors: Environmental effects, *Seasonal fish, Lakes, *Lawrence Lake(Mich), Michigan, *Distribution, Ecology, Habitats, *Temperature, *Foods chain, Food abundance, *Littoral.

The littoral zone fishes in Lawrence Lake were found to undergo significant seasonal movements which were correlated with seasonally changing food levels and vegetation development. Seasonal temperature changes set the larger bounds on the movements and the habitats utilized, but ecological interactions appeared to be responsible for the finer resolution of microhabitat utilization among size classes and species. All species exhibited less habitat segregation under conditions of warmer temperatures and abundant food. (Chilton-ORNL)
W78-04240

TRACE METAL CONTAMINATION OF BLUEGILL (LEPOMIS MACROCHIRUS) FROM TWO INDIANA LAKES,
Prudue Univ., Lafayette, IN. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W78-04243

VARIATIONS IN THE VEGETATION OF NORTHWEST GERMAN MOORLAND PONDS, (IN GERMAN),
Landesmuseum fuer Naturkunde, Muenster (West Germany).
F. Runge.
Abh Naturwiss Ver Bremem. 37(3/4), p 421-428, 1974.

Descriptors: *Moorland ponds(Northwest Germany), *Plant growth, Betula-Spp, Climates, Deschampsia-setacea, Drosera-rotundifolia, Eleocharis-multicaulis, Equisetum-limosum, Evaporation, Hydrocotyle-vulgaris, Hypericum-elodes, Juncus-bulbosus, Littorella-uniflora, Molinia-coerulea, Polygonum-spp, *Ponds, Sphagnum-auriculatum, Sphagnum-spp, *Vegetation, *Water level.

These ponds average only a few decimeters in depth and the water level varies according to precipitation and evaporation. In droughts they sometimes dry up entirely. Plant associations grow on sand or on mud and peat. Isoeto-Lobietum are most numerous in this region. The covering percentage of Eleocharis multicaulis, Hypericum elodes, Hydrocotyle vulgaris, Juncus bulbosus, Drosera rotundifolis, Molinia coerulea, Betula seedlings and Sphagnum auriculatum was compared with the water level variations from 1960-1965. At another location, the same comparision was made with the covering percentage of E. multicaulis, H. elodes, Deschampsia setacea, Littorella uniflora, J. bulbosus, H. vulgaris, Equisetum limosum, Polygonum seedlings and S. auriculatum.--Copyright 1975, Biological Abstracts, Inc.
W78-04244

WATER-QUALITY EFFECTS ON BAKER LAKE OF RECENT VOLCANIC ACTIVITY AT MOUNT BAKER, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-04260

ZOOBENTHOS OF THE SOLIGORSK RESERVOIR, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Dept. of Zoology and Parasitology.
T. I. Nyakhayeva.
Vyestsi Akad Navuk BSSR Syer Biyal Navuk. 5, p 110-113, 1974.

Descriptors: Belorussian-SSR, *Benthos, *Biomass, Reservoirs, *Seasonal, *USSR(Soligorsh Reservoir), *Zoobenthos.

The qualitative and quantitative composition of zoobenthos of the Soligorsk Reservoir in the Minsk district of the Belorussian SSR (USSR), the quantitative indices from May-Aug., and the distribution in various areas of the reservoir are given. The average seasonal biomass of benthos in 1972 was 21.52 g/m2.--Copyright 1975, Biological Abstracts, Inc.
W78-04283

HEAT CONTENT OF LAKE ONTARIO AND ESTIMATES OF AVERAGE SURFACE HEAT FLUXES DURING IFYGL,
Canada Centre for Inland Waters, Burlington (Ontario).
F. M. Boyce, W. J. Moody, and B. L. Killins.
Technical Bulletin No 101, 1977. 120 p, 12 fig, 12 tab, 11 ref, 6 append.

Descriptors: *Heat, *Heat flow, *Fluctuations, *Convection, Average, Rivers, Streams, Rain, Snow, Ice, Melting, Industrial wastes, Municipal waste, Great Lakes, *Lake Ontario, *Surface heat, Energy Balance Program.

This report is a contribution to the Energy Balance Program of The International Field Year on the Great Lakes. The net heat flux across the surface of Lake Ontario from April 1972 until June 1973 is estimated using data from 46 ship cruises and measurements of river temperatures and discharges. An effort has been made to compute the degree of uncertainty attached to the heat flux values. Results are given in graphical and tabular form; the latter are interpolated to standard weekly intervals. (WATDOC)
W78-04355

THE EUTROPHIC POTENTIAL OF WAHIAWA RESERVOIR SEDIMENTS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W78-04366

METHANE IN LAKE ERIE: ANALYSIS OF MECHANISMS OF PRODUCTION AND OF AMOUNTS PRODUCED,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-04373

THE CHEMICAL CONDITIONS OF THE WATER IN LAKE KAVSJON, (IN SWEDISH),
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-04434

PROCESSING LAKES WITH DAMAGED ECOSYSTEMS (IN GERMAN),
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-04436

STRATIGRAPHY AND EVOLUTION OF BOGS IN MIRE TERRITORY OF THE RIGHT-BANK FOREST-STEPPE, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Dept. of Geobotany and Palebotany.
A. I. Kuz'Mychov.
Ukr Bot Zh. 31(5), p 594-599, 1974.

Descriptors: Alder, Bank, *Bogs, *Evolution, Forests, Minerals, Mire, Nutrition, Pine, Reed, Steppe, *Stratigraphy, *Swamps, *Ukrainian-SSR, USSR, Eutrophication.

The mire area of the Right-Bank Forest-Steppe (Ukrainian SSR, USSR) is situated in the Dnieper Upland with sharp relief. The bogs appeared here in the valley-ravine network, sometimes on the pine-forest terrace and in the sand interfluves. Reed peat prevails in the peat bogs; the alder-reed and sedge-reed types of peat are rare. The peats differ in ash content. The red peat accumulation is most widely distributed, the swampy-forest and multilayer-swampy accumulations occur less frequently. Reed dominated in the plant cover at the initial stage of paludification of the valley peat bogs. In the bog terraces, development began from the forest alder stage with a prevalence of reed in the peat cover. Paludification in young postglacial, strongly entrenched ravines also began from the forest stage. The following stages of bog development depended on the degree of flow and flooding. Mineral nutrition was not decisively important as it was maintained at a rather high level. In certain bogs of the Right Bank Forest-Steppe, in the southern steppe belt in particular, where aqueous nutrition was unchanged, reed always dominated. At present the bogs in the valley-ravine network are at the eutrophic stage of development. As a result of economic activity and erosion part of the peat bogs, especially ravine bogs are covered with mineral drift.--Copyright 1975, Biological Abstracts, Inc.
W78-04475

POPULATION OF BENTHIC MACROINVERTEBRATES IN HAM'S LAKE,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-04493

LAKE CIRCULATION INDUCED BY DENSITY CURRENTS: AN EXPERIMENTAL APPROACH,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geologisches Inst.
A. M. Lambert, and S. M. Luthi.
Sedimentology, Vol. 24, No. 5, p 735-741, October 1977. 3 fig, 2 tab, 13 ref.

Descriptors: *Density currents, *Lakes, *Water circulation, *Laboratory tests, Hydraulic models, Movement, Measurement, Currents(Water), Tracking techniques, Supercritical flow, Subcritical flow, Velocity, Profiles, Analytical techniques, Methodology, Data collections, Foreign research, Foreign countries, Tracers, Underflow, *Switzerland.

This short note reported a series of density current experiments designed to model turbidity underflows caused by flood-stage discharge of lake-tributaries. In a 5.8 m long tank filled with freshwater, saltwater was fed in continuously, flowing down a 15 deg 'delta' slope onto a horizontal floor. These density currents maintained steady-state characteristics. The main objectives of this investigation were to determine: (1) the flow regime of the density currents, and (2) the under-flow-induced movements in the freshwater. Reynolds numbers for 35 runs ranged from 70 to 4100. Experiments with laminar flow reproduced kinematic (Froudian) models of underflows measured in the Walensee (Switzerland). Flow was supercritical on the slope and subcritical on the floor. Turbulent flow experiments yielded velocity profiles (with a maximum at the flow interface) which approximate natural conditions. Movements in formerly stagnant water body are induced by interfacial shear stress: a layer of freshwater is dragged along by the density current and replaced by the backward flow of an equal amount of overlying water (mass conservation). Extrapolated to a natural setting, circulation induced by underflows is probably an important mechanism for oxygenating deep lacustrine basins. (Humphreys-ISWS)
W78-04505

UNUSUAL RESPONSE OF A CUPRIC ION ELECTRODE IN PRAIRIE LAKE WATERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W78-04527

THE MORPHOMETRY, BENTHOS AND SEDIMENTATION RATES OF A FLOODPLAIN LAKE IN POOL 9 OF THE UPPER MISSISSIPPI RIVER,
Luther Coll., Decorah, IO. Dept. of Biology.
J. W. Eckblad, N. L. Peterson, K. Ostlie, and A. Temte.
American Midland Naturalist, Vol 97, No 2, p 433-443. 1977. 2 fig, 5 tab, 21 ref.

Descriptors: *Wetlands, *Flood plains, *Sedimentation rates, *Rooted aquatic plants, *Benthic fauna, *Ecological distribution, Backwater, Lakes, Sedimentation, Aquatic plants, Floating plants, Aquatic animals, Invertebrates, Clams, Aquatic insects, Aquatic habitats, Biomass, Dominant organisms, Productivity, Mississippi River, *Lake sediments, *Sagittaria, Sphaerium, Hexagenic, *Big Lake(Iowa), Macroinvertebrate abundance, Backwater lake.

Big Lake is a shallow (mean depth 0.89 m) 256-ha backwater lake on the Mississippi River floodplain. Between 1896 and 1973 about 76 cm of sediment had accumulated in the original basin with a recent sedimentation rate of 1.7 cm/year. The calculated annual reduction in lake volume is 37,400 cu m/year giving the lake a projected life span of 61 years. About 16 percent of the surface area is covered by emergent stands of Sagittaria which extend out to a depth of 0.3 m. With a projected decreased depth accompanying sedimentaion, there should be continued expansion of the Sagittaria stands; a similar expansion would also be expected for floating Nulumbo lutea and Nymphaea odorata which are also common. Sphaerium and Hexegenia were the dominant macroinvertebrate taxa making up 81 percent of the biomass. Both taxa showed greatly reduced abundance and biomass among the Sagittaria stands. As Sagittaria continues to encroach on the open water, the present macroinvertebrate dominance will likely shift to a dominance of Chironomidae, Oligochaeta and Gastropoda which will also influence organisms at higher trophic levels. (Steiner-Mass)

W78-04537

HYDROLOGY OF TWO SMALL WETLAND BASINS IN EASTERN MASSACHUSETTS,
Lowell Univ., MA. Dept. of Earth Sciences.
A. L. O'Brien.
Water Resources Bulletin, Vol 13, No 2, p 325-340, April, 1977. 10 fig, 3 tab, 11 ref.

Descriptors: *Wetlands, *Hydrologic budget, *Discharge(Water), *Evapotranspiration, *Streamflow, *Peat, Freshwater marshes, Hydrology, Groundwater, Recharge, Base flow, Groundwater basins, Surface drainage, Surface-groundwater relationships, Marshes, Muck soils, *Massachusetts, *Swamps.

A hydrologic budget was prepared for two geologically different wetland basins in Eastern Massachusetts for the 1971 water-year. Water table conditions prevailed at one wetland underlain by peat while an artesian system functioned at the other wetland which was underlain by muck. Hydrologic responses were generally similar at both wetlands, although each functioned differently in detail. Both wetlands exhibited high spring discharges and depressions of low flow. Ground water accounted for an estimated 93 percent of the total annual discharge from both wetlands; in late summer the peat deposit recharged the regional groundwater body. Evapotranspiration in the spring was retarded in probable consequence of extreme wetness of the wetland soils. (Steiner-Mass)
W78-04539

PALEOECOLOGICAL ASPECTS OF THE RED LAKE PEATLAND, NORTHERN MINNESOTA,
Oslo Univ. (Norwich). Inst. of Geology.
K. O. Griffin.
Canadian Journal of Botany, Vol 55, p 172-192, 1977. 9 fig, 64 ref.

Descriptors: *Wetlands, *Bogs, *Peat, *Stratigraphy, *Succession, *Pollen, Marshes, Freshwater marshes, Fens, Humus, Soil formation, Radioactive dating, History, *Minnesota, Aquatic plants, Marsh plants, Cattails, Environmental effects, Distribution patterns, Sediments, Biological communities, Environmental gradient, Mixed forests, Forests, Grasslands, Core drilling, *Paleoecology, *Red Lake Peatland(Minn), Lake Agassiz plain(Minn).

The Red Lake Peatland, situated on the eastern arm of the Lake Agassiz plain, is composed of large black spruce raised bogs separated by sedge-covered water tracks, and teardrop-shaped forested islands. About 3 m of peat overlie a prairie soil: the basal peat is 3170 plus or minus 100 years old (C14 date). Stratigraphic distribution of pollen, macrofossils, and peat components along a small forested island was used to study the peatland development. In pollen zone 1 (lowest) the upland pollen types suggest an oak savanna with a developing mesic deciduous forest. The local pollen indicates a succession from a Typha marsh to a sedge meadow. Zone 2 shows a small rise in Pinus pollen: Ericaceae pollen and Sphagnum spores indicate the development of the bog-heath vegetation type at the site. An increase in pollen of spruce and larch marks the island forest establishment. Zone 3 (upper) is marked by a rise in Ambrosia pollen, recording agricultural land clearance in northwestern Minnesota about 1890. The upward succession of communities observed can be duplicated along a west-to-east surface traverse across the present prairie-forest transition. The stratigraphic succession thus records the westward movement of the prairie-forest transition. (Steiner-Mass)
W78-04544

PHOSPHORUS ACCUMULATION--DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04545

COASTAL WETLANDS ALONG LAKE ONTARIO AND THE ST. LAWRENCE RIVER IN JEFFERSON COUNTY, NEW YORK,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
J. W. Geis, and J. L. Kee.
August, 1977, 130 p. 2 fig, 46 tab, 24 ref, 41 maps.

Descriptors: *Lake Ontario, *St Lawrence River, *Wetlands, Freshwater marshes, Lake shores, Maps, Evaluation, *New York, *Classification, Surveys, Jefferson Co(NY), Cover types.

Individual wetlands of more than 25 acres were located on panchromatic aerial photography and low elevation color photography. A system of vegetative cover description and mapping was developed for lake-level influenced wetlands in Jefferson Co., New York and applied to 41 wetlands ranging in size from 5.9 to 1007.4 acres. Descriptions of individual wetlands include location, cover types present and the area of each type, and a map. Enhancement potential is noted. A table briefly characterizes 59 smaller wetlands. Two wetland evaluation systems developed by Golet and the New York State Department of Environmental Conservation were applied to the wetlands. Scores of the two systems showed a weak positive correlation. The over 769 acres of recently killed wetland vegetation found in the larger shoreline wetlands were apparently due to high water levels during 1972-1974. (Stihler-Mass)
W78-04546

THE GREAT LAKES CLEANUP,
International Joint Commission-United States and Canada. Great Lakes Regional Office.
For primary bibliographic entry see Field 5G.
W78-04586

A TAXONOMIC AND ECOLOGICAL STUDY OF SOME ALGAE IN TWO PONDS IN SOUTH SHELBY COUNTY, TENNESSEE,
Memphis State Univ., TN.
M. P. Brown.
J Tenn Acad Sci. 49(1), p 9-10, 1974.

Descriptors: *Algae, *Cyanophyta, Ecological distribution, Physicochemical studies, Ponds, Taxonomic studies, *Tennessee.

Two ponds in south Shelby County, Tennessee, were compared with respect to algal flora and ecology. Thirty-nine genera of algae (Cyanophyta and other groups) were collected and identified and observations were made regarding the physical and chemical conditions in which they were found.--Copyright 1975, Biological Abstracts, Inc.
W78-04663

RELATIONSHIPS OF FISH YIELD TO LAKE PHYTOPLANKTON STANDING CROP, PRODUCTION AND MORPHOEDAPHIC FACTORS,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
R. T. Oglesby.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p 2271-2279, 4 fig, 2 tab, 42 ref.

Descriptors: *Model studies, Ecology, Fish management, Lakes, Fish, *Phytoplankton, *Standing crops, *Primary productivity, *Morphoedaphic index.

The study makes use of models in the form of log-log regressions to relate fish yield to annual primary production, summer phytoplankton standing crop, and the morphoedaphic index for a wide variety of lake types. It was found that models which are based upon fish yield as a function of phytoplankton production or standing crop are more accurate than those related to morphoedaphic factors. It was suggested that existing fishery management approaches might be supplemented by the use of expectation-variability diagrams to obtain an overview of the problem, selection of an appropriate model to predict yield, prediction of a range of yields, and implementation of regulations which have proved successful for other lakes in the same yield category. (Chilton-ORNL)
W78-04667

AIRCRAFT AND SATELLITE MONITORING OF LAKE SUPERIOR POLLUTION SOURCES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-04695

ENVIRONMENTAL MONITORING NEEDS IN REGION V,
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5A.
W78-04698

2I. Water In Plants

CERTAIN FEATURES OF THE STRUCTURE OF FRESHWATER PHYTOPHILOUS INVERTEBRATE COMMUNITIES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
L. N. Zimbalevskaya.
Gidrobiol Zh. 10(6), p 38-46, 1974.

Descriptors: *Freshwater invertebrate, *Metabolism, *Phytophilous invertebrates, *Respiration, Aquatic animals, Biomass.

When ranking species in communities of phytophilous invertebrates by magnitude of respiratory metabolism, an alternation of species with different modes of nutrition and with size differences is observed which may be considered manifestation of the degree of communities structure. An inverse relationship between invertebrate numbers and their size is established. Variation indices correlate with relative indices of species' predominance according to biomass.--Copyright 1975, Biological Abstracts, Inc.
W78-04239

EFFECT OF MOWING TIMES ON REGENERATION OF REED AND REEDMACE GROWTHS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Rostov-na. Donu (USSR).
For primary bibliographic entry see Field 4A.
W78-04524

GROWTH RESPONSES OF COASTAL HALOPHYTES TO INORGANIC NITROGEN,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-04542

THE VEGETATION OF SALT MARSHES AT SOME COASTAL SITES IN ARCTIC NORTH AMERICA,
Toronto Univ. (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 2L.
W78-04543

EVALUATION OF THE POLLUTION AND DROUGHT HYPOTHESES IN RELATION TO

LICHENS AND BRYOPHYTES IN URBAN ENVIRONMENTS,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04635

MOVEMENT OF MERCURY-203 IN PLANTS,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W78-04658

THE STUDY OF PARASITISM IN SIMULIDS (DIPTERA) BY THE MERMITHIDAE (NEMATODA) IN WEST AFRICA: PRELIMINARY OBSERVATIONS ON A TEMPORARY (SEASONAL) STREAM IN THE SAVANNA, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast).
B. Mondet, B. Pendriez, and J. Bernadou.
Cah O R S T O M Ser Entomol Med Parasitol 14(2), p 141-150, 1976.

Descriptors: *Africa, *Diptera, Gastromermis-sp, *Mermithidae(Parasites), *Nematoda, Neomesomermis-sp, *Parasitism, Savannas, Seasonal, *Simuliids, Simulium-damnosum, Streams, West Africa.

Research on mermithid parasites of West African simuliids (larvae, pupae and adults) indicated that there were 5 spp. from the genera Neomesomermis, Gastromermis and a new (unnamed, undescribed) genus. All the species of Simuliidae found in the same breeding site as Simulium damnosum were parasitized by these mermithids and none were specific. New species of the new genus parasitic in S. damnosum are dealt with. Three stages were observed in the parasitic development of these mermithids. The maximum size attained by males was 10.2 mm and by females 16.2 mm. The highest number of mermithids found in a single Simulium larvae was 8. Larvae parasitized in the early instars always died before pupating and the parasites emerged through the cuticle. Larvae newly parasitized in the later instars normally pupated before the mermithid had completed development. Parasitized pupae reached eclosion. The main consequences of parasitism in female S. damnosum were atrophy of the ovaries in 98.9% of individuals, and about half the longevity as compared to non-parasitized females when both were held in the laboratory. The rate of parasitism in an isolated population of S. damnosum females was followed during the rainy season. Three phases are clearly defined in the evolution of the parasitism: a period of appearance, a period of marked increase and a period of maintenance at a high level. The incidence of parasitism in the final period was 75-80% of nulliparous females and 20-35% of the entire population.--Copyright 1977, Biological Abstracts, Inc.
W78-04672

2J. Erosion and Sedimentation

PHYSICAL AND CONCEPTUAL SIMULATION OF EFFLUENTS FROM DREDGED MATERIAL CONFINEMENT FACILITIES,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04203

RANGE, VELOCITY, AND MATERIAL FLUX OF COMPACTION FLOW IN GROWING SEDIMENTARY SEQUENCES,
Tuebingen Univ. (West Germany). Geologisch-Palaontologisches Inst.
G. Einsele.
Sedimentology, Vol. 24, No. 5, p 639-655, October 1977. 7 fig, 1 tab, 25 ref.

Descriptors: *Sediment transport, *Flow, *Velocity, *Ranges, Sedimentation rate, Erosion, Diffusion, Streamflow, Hydrology, Clays, Compaction, Material flux, Sedimentary sequences, Sediment-water interface, Compaction flow.

In growing sedimentary sequences, range and velocity of vertically ascending pore water (advection) can be determined quantitatively by using a simple graphical method. During continuing deposition and maintenance of compaction equilibrium, the pore water from deeper layers cannot reach the sediment-water interface. Range and velocity of advective flow decrease from top to bottom of a sequence and depend on the thickness affected by compaction. The velocity of pore water flow as well as the transport of solutes by advective flux are proportional to the sedimentation rate. Compaction flow also can result from underconsolidation and diagenetic reduction of pore space. At the sediment-water interface, a direct contact between the ascending pore water and the overlying water is feasible only under special conditions (interrupted sedimentation over underconsolidated material, erosion). These results were demonstrated on geometric models of sedimentary sequences, on experimentally deposited clay, and on selected examples of the Deep Sea Drilling Project. (Lee-ISWS)
W78-04209

SIGNIFICANCE OF CM DIAGRAMS OF SEDIMENTS DEPOSITED BY SUSPENSIONS,
R. Possega.
Sedimentology, Vol. 24, No. 5, p 723-733, October 1977. 3 fig, 10 ref.

Descriptors: *Graphical methods, *Particle size, *Deposition(Sediments), *Sedimentation, Environment, Currents(Water), Turbulence, Suspended load, Classification, Detritus, Indicators, Correlation analysis, *Parameters, *CM diagrams, Bottom turbulence.

CM grain-size diagrams of clastic deposits were introduced in 1957. Since that time a large number of diagrams representing most environments were constructed. Discussions of parameters C and M showed that these parameters are indicators of hydraulic conditions under which sediments were deposited. In a 1975 paper Vandenberghe discussed the CM diagram of the Boom Clay, Belgium, and concluded that CM diagrams gave indications on the mechanism of sediment deposition. In order to answer Vandenberghe's assertions, the writer systematically compared the numerous CM diagrams representing suspension deposits with the characteristics of the environments. Result of this comparison was that CM diagrams give coherent indications on deposition which agree with the known environment characteristics. The Boom Clay diagram is no exception. Another result of the present study was that, in environments as a whole, two types of currents can be recognized, distinguished by the relation between bottom turbulence and grain-size of sediment in suspension. Deposits of these two current types and distribution of bottom turbulence are indicated by CM diagrams. Characteristics of these currents vary with the environment and help the reconstruction of ancient environments. (Visocky-ISWS)
W78-04210

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1976,
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-04259

SUSPENDED SEDIMENT FLUX THROUGH A SALT MARSH DRAINAGE BASIN,
Auburn Univ., AL. Dept. of Geology; and Auburn Univ., AL. Environmental Office.
For primary bibliographic entry see Field 2L.
W78-04333

THE EFFECT OF SOIL MOISTURE ON RESISTANCE TO WIND EROSION, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Inst. of Mechanical Seismic Resistant Construction.
For primary bibliographic entry see Field 2G.
W78-04337

A RADIOTRACER TECHNIQUE FOR MEASURING SEDIMENT MOVEMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
R. W. Durham, and R. J. Goble.
Scientific Series No. 80, 1977. 16 p, 11 fig, 5 ref.

Descriptors: *Sediment load, *Measurement, Technology, *Tracers, *Radioactivity, Movement, Erosion, Erosion control, Instrumentation, *Sediment transport.

A technique for measuring the direction of movement of sandy sediments by means of a radiotracer is described. An artificial sediment fabricated from glass containing a small percentage of arsenic is irradiated in a nuclear reactor to produce sup 76AS (T.5 equals 26.4 hr). This material is then inserted into the particular sediment to be studied and its movement followed by monitoring the 560-keV gamma-ray emission with a submersible NaI detector. A test of the method at Point Pelee on the north shore of Lake Erie with 140 g of artificial sediment containing 180 mCi of sup 76AS demonstrated that the redistribution of the radioactive material by the bottom current could be readily followed for at least three days after insertion. (WATDOC)
W78-04344

HYDROLOGIC FACTORS AND ENVIRONMENTAL IMPACTS OF MASS SOIL MOVEMENTS IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 4D.
W78-04365

GRAVELLY FLOOD DEPOSITS OF IRVINE CREEK, ONTARIO, CANADA,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
I. P. Martini.
Sedimentology, Vol. 24, No. 5, p 603-622, October 1977. 10 fig, 1 tab, 42 ref.

Descriptors: *Floods, *Canada, *Deposition(Sediments), *Gravels, Bed load, Flash floods, Sand bars, Sediment transport, Sedimentation, Sedimentation rate, Sands, River beds, Runoff, Hydrology, *Riffle bars, Gravel deposits, Fine pebbles, *Irvine Creek(Ont).

In May 1974 a powerful flood flushed the Grand River basin, Ontario. The effects on the bedload were drastic in a narrow (30 m) and deep (40 m) rock walled and floored gorge near Elora, Ontario. Along Irvine Creek, the tributary occupying the gorge, the gravel cover was reworked in several types of bars, predominantly transverse and point bars. The bars formed very rapidly in response to essentially steady, non-uniform flow that developed during a brief period of high flood. Superimposed on major bars are several minor sedimentary features such as coarse transverse ribs, chute channels and bars, longitudinal ribs, imbrication clusters, backsets with well developed imbrication, that were formed under very high stream discharge. Structures like imbrication clusters, transverse ribs, and small riffle bars require a 'live bed' situation to form, and they develop when stones come to a stop either because they cluster during transport or because keystone effects occur along shallow channels. In Irvine Creek, very few sedimentary features were

formed during waning and low flood stages: only some shadow deposits and a few Ostler lenses. The few fines that were available were lost downstream or filled in lower parts of gravel beds. This study confirmed that in streams that experience strong seasonal fluctuations in discharge, bedforms that develop during high floods have a high probability of preservation. In gravelly deposits, foreset structures and plane beds are preserved most commonly, although they may be difficult to recognize in old deposits, which may appear massive, particularly if the gravel has been infilled with finer pebbles and sand. In the case of Irvine Creek, all deposits are organized, and lateral and vertical variations in textures, particularly imbrication and packing, are very useful in the recognition of sedimentary structures. (Lee-ISWS)
W78-04503

THE SLIDING BED FACIES IN ESKER SANDS AND GRAVELS: A CRITERION FOR FULL-PIPE (TUNNEL) FLOW,
Wilfrid Laurier Univ., Waterloo (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 8B.
W78-04504

THE ROLE OF VORTICITY IN DEVELOPING LINEATION BY WIND EROSION,
Central Michigan Univ., Mount Pleasant.
M. I. Whitney.
Geological Society of America Bulletin, Vol. 89, No. 1, p 1-18, January 1978. 9 fig, 10 ref.

Descriptors: *Wind erosion, *Erosion, *Boundary processes, *Michigan, On-site investigations, Laboratory tests, Geomorphology, Flow, Topography, Air-earth interfaces, Abrasion, Shape, Sands, Rocks, Movement, Snow, Ripple marks, Distribution patterns, Vortices, Wind blasting, Lineations, Secondary flow.

Experiments and field observations from a 15-yr investigation indicated that both the gross shaping and the sculpturing of lineation and pit details on wind-eroded surfaces may be accomplished by interfacial flow or by vorticity. The vorticity operates along lines of positive, negative, and secondary flow over all surfaces of an object. The axis of vorticity is typically normal to or at some high angle to the surface undergoing erosion. Therefore, it is not the so-called roller vortex type which has been postulated by other investigators, for one typical erosion pattern left abundantly by the vortex configuration is a round pit either helically or radically scored. Often such pits occur in chains along the beds of the lineation, which was observed in development in snow flutes under influence of normal-axis vortices. Such vortices travel singly along lines of flow, pulling particles centripetally into the vortex configurations. In snow flutes, for example, vortices become visible due to suspended snow, and the secondary flow can be delineated. Where general windflow is essentially unidirectional, the erosional result of such vorticity is the creation of cross-lineated, essentially symmetrical grooves. (Humphreys-ISWS)
W78-04517

MINIMUM STREAM POWER FOR RIVERS AND DELTAS,
San Diego State Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-04519

DESICCATION AND CONSOLIDATION OF DREDGED MATERIALS,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 5G.
W78-04525

THE MORPHOMETRY, BENTHOS AND SEDIMENTATION RATES OF A FLOODPLAIN LAKE IN POOL 9 OF THE UPPER MISSISSIPPI RIVER,
Luther Coll., Decorah, IO. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W78-04537

2K. Chemical Processes

CHEMICAL COMPOSITION OF SNOW ON THE WATER SURFACE OF THE KAMA AND VOTKINSK RESERVOIRS,
Perm State Univ. (USSR). Lab. of Water Management Research.
For primary bibliographic entry see Field 2C.
W78-04222

ANALYSES OF NATIVE WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED FROM THE ATCHAFALAYA RIVER AND ATCHAFALAYA BAY,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-04245

ON THE WATER EXAMINATIONS OF THE RIVERS AT THE PIEDMONT DISTRICT OF MT. TOKACHI IN AND AROUND KAMIFURANO CHO, (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
For primary bibliographic entry see Field 5B.
W78-04313

RELATIONSHIPS BETWEEN WATER CHEMISTRY AND PRIMARY PRODUCTS IN STREAMS, A LIMNOLOGIC PROBLEM, (IN GERMAN),
Zurich Univ. (Switzerland). Inst. fuer Pflanzenbiologie.
For primary bibliographic entry see Field 5C.
W78-04339

MOBILITY OF HEAVY METAL HUMATES IN SOILS AND SURFACE WATERS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W78-04494

PROBLEMS WITH THE USE OF ULTRAVIOLET ABSORPTION FOR MEASURING CARBON COMPOUNDS IN A RIVER SYSTEM,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5A.
W78-04513

MODEL DDO/MARK V DIGITAL DISSOLVED OXYGEN ANALYZER.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04547

BECKMAN FIELDLAB DISSOLVED OXYGEN SYSTEM.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04548

DISSOLVED OXYGEN ANALYZER MODEL 330.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04549

IRON AND PHOSPHORUS INTERACTION IN CALCAREOUS SOILS: I. EFFECT ON GROWTH, PHOSPHORUS, AND IRON CONTENT OF PLANT,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
For primary bibliographic entry see Field 2G.
W78-04671

2L. Estuaries

WAVE PERIOD EFFECT ON THE STABILITY OF RIPRAP,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-04214

FEASIBILITY STUDY FOR DYKE MARSH DEMONSTRATION AREA, POTOMAC RIVER, VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W78-04216

DISPERSION OF PROPOSED THEODORE INDUSTRIAL PARK EFFLUENTS IN MOBILE BAY, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W78-04229

WAVE ATTENUATION BY ARTIFICIAL SEAWEED,
Coastal Engineering Research Center, Fort Belvoir, VA.
J. Ahrens.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 274, Price codes: A02 in paper copy, A01 in microfiche. Miscellaneous Report No. 76-9, June 1976. 13 p, 4 fig, 2 tab, 7 ref.

Descriptors: *Shore protection, *Waves(Water), *Laboratory tests, Ocean waves, Coasts, Beaches, Shores, Coastal engineering, *Artificial seaweed, *Wave attenuation, Wave tank tests.

A series of wave tank tests was conducted at the Army Coastal Engineering Research Center (CERC) to determine the ability of a field of low specific gravity artificial seaweed to attenuate wave action. Wave gages were located on both sides of the seaweed field to measure wave attenuation. The field consisted of seven rows of seaweed with the rows spaced 3m (10 ft) apart. Ten distinct wave conditions were tested using periods ranging from 2.6 to 8.2 sec and wave heights from 0.24 to 1.1 m (0.8 to 3.6 ft). The still-water depth for all tests was 2.4(m)(8 ft). There was a measureable level of wave attenuation for only the shortest period, 2.6 sec. For the 2.6-sec period, the reduction in wave height on passing through the seaweed field was about 12%. (Sims-ISWS)
W78-04232

GROUND-WATER RESOURCES OF THE RIVIERA BEACH AREA, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04247

SALINE-WATER INTRUSION IN THE FLORIDAN AQUIFER IN THE FERNANDINA BEACH AREA, NASSAU COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.

W78-04248

DIGITAL FLOW MODEL OF THE CHOWAN RIVER ESTUARY, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
C. C. Daniel, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 286, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Investigations 77-63, August 1977. 84 p, 22 fig, 3 tab, 25 ref.

Descriptors: *Streamflow, *Estuaries, *North Carolina, *Computer models, *Tidal effects, Continuity equation, Streamflow, Flow rates, River basins, Tributaries, Virginia, Data collections, Marshes, Evapotranspiration, Evaporation, Rainfall, Wind tides, *Chowan River basin(NC), Blackwater River, Nottoway River, Meherrin River, Wiccacon River, Upstream tidal-flow rates.

A one-dimensional deterministic flow model based on the continuity equation had been developed to provide estimates of daily flow past a number of points on the Chowan River estuary of northeast North Carolina. The digital model, programmed in Fortran IV, computes daily average discharge for nine sites; four of these represent inflow at the mouths of major tributaries, the five other sites are at stage stations along the estuary. Because flows within the Chowan River and the lower reaches of its tributaries are tidally affected, flows occur in both upstream and downstream directions. The period of record generated by the model extends from April 1, 1974, to March 31, 1976. During the two years of model operation the average discharge at Edenhouse near the mouth of the estuary was 5,830 cfs (cubic feet per second). Daily average flows during this period ranged from 55,900 cfs in the downstream direction on July 17, 1975, to 14,200 cfs in the upstream direction on November 30, 1974. (Woodard-USGS)
W78-04250

SUBMARINE SEEPAGE OF NATURAL GAS IN NORTON SOUND, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab., and Geological Survey, Seattle, WA. Geology Div.
For primary bibliographic entry see Field 5B.
W78-04262

EXPENDABLE OCEANOGRAPHY PROBE,
Matsushita Electric Industrial Co., Ltd., Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 7B.
W78-04317

SUSPENDED SEDIMENT FLUX THROUGH A SALT MARSH DRAINAGE BASIN,
Auburn Univ., AL. Dept. of Geology; and Auburn Univ., AL. Environmental Office.
J. L. Settlemyre, and L. R. Gardner.
Estuarine and Coastal Marine Science, Vol 5, No 5, p 653-663, September 1977. 3 fig, 2 tab, 20 ref. OWRT B-055-SC(6) and S-044-SC.

Descriptors: *Tidal marshes, *South Carolina, *Sediment transport, *Salt marshes, Watersheds(Basins), Coasts, Estuaries, Suspended solids, Organic matter, Tidal waters, Tidal effects, On-site investigations, Turbidity, *Charleston(SC).

The net transport of total suspended sediment (TSS), inorganic suspended sediment (ISS), and organic suspended sediment (OSS) was determined for a Charleston Harbor tidal creek during 25 randomly selected tidal cycles. The results indicated that the salt marsh basin exports OSS and imports ISS. Export of TSS and OSS occurs preferentially in the summer, whereas in winter, there is import of TSS and ISS and a general balance of OSS transport. On a seasonally adjusted basis, the yearly budgets for TSS, ISS, and OSS are respectively -393 g/sq m/yr, +280 g/sq m/yr, and -673 g/sq m/yr. Turbidity monitoring through tidal cycles indicated that import of TSS and ISS may occur at any time of the year when wind conditions maintain high suspensate concentrations in the final stage of flood flow. The supply of river-borne sediment to South Carolina estuaries and the rate of ISS import were compared to the theoretical sedimentation rate required for vertical marsh growth to keep pace with coastal submergence. OSS export was compared to the estimated above-ground production of Spartina for South Carolina marshland. Correspondence between the rates is significant but should not be interpreted too literally because of the assumptions and uncertainties involved in the extrapolation of data from a single sampling location to large areas. More data are needed to substantiate the quantities of sediment transport and relationships reported. (Humphreys-ISWS)
W78-04333

A THREE-DIMENSIONAL TURBULENT ENERGY MODEL FOR NONHOMOGENEOUS ESTUARIES AND COASTAL SEA SYSTEMS,
Rand Corp., Santa Monica, CA.
J. J. Leendertse, and S. K. Liu.
To be Published in: 'Hydrodynamics of Estuaries and Fjords,' included in the Elsevier Oceanography Series. Elsevier Scientific Publishing Company, Amsterdam. (1977). 18 p, 13 fig, 8 ref. OWRT C-7072(No 6231)(1).

Descriptors: *Three-dimensional flow, *Estuaries, *Mathematical models, Numerical methods, Tides, Fluid dynamics, Computer models, Coastal engineering, Development of models, Finite differences, Simulation, Unsteady flow, *Model studies.

Three-dimensional flows in water bodies with nonhomogeneous density can be computed effectively by use of a finite difference model which contains an equation of continuity, equations describing conservation of momentum, salinity, temperature, subgridscale energy, and an equation of state. In the model, vertical accelerations are neglected, but not the vertical velocities. The vertical exchange coefficients are computed from the subgridscale energy intensity. The introduction of turbulence closure by computing vertical exchange coefficients in the transport equations eliminates the necessity of evaluating exchange coefficients in the whole computation field, but rather requires the evaluation of only a few characteristic parameters. Experiments made with the model produced velocity distributions which typically occur in coastal areas.
W78-04343

THE DISTRIBUTION, COMPOSITION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE NORTHEASTERN GULF OF ALASKA, SOUTHEASTERN BERING SHELF AND LOWER COOK INLET,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04460

OPTIMIZATION OF AN OCEAN THERMAL ENERGY CONVERSION SYSTEM,
Swarthmore Coll., PA. Dept. of Engineering.
For primary bibliographic entry see Field 8C.
W78-04474

AN EVALUATION OF A COMPUTER SIMULATION MODEL OF PLANKTON DYNAMICS IN MONTEREY BAY,
Naval Postgraduate School, Monterey, CA.
For primary bibliographic entry see Field 5C.

W78-04480

VELOCITY FIELD INTERPOLATION IN STRATIFIED ESTUARIES USING A PSEUDO-POTENTIAL METHOD,
John Hopkins Univ., Baltimore. MD. Chesapeake Bay Inst.
J. R. Hunter.
Water Research, Vol. 11, No. 11, p 1001-1003, 1977. 6 ref.

Descriptors: *Estuaries, *Flow, *Velocity, *Mathematical models, Model studies, Equations, Turbulence, Salinity, Dynamics, Oceanography, *Pseudo-potential method, Vorticity.

A method of numerically deriving a steady-state three-dimensional velocity field from defined boundary values was described. The field is continuous and subject to certain constraints on the vorticity. The method appears to offer a suitable description of the stratified circulation in type 1 and type 2 estuaries. (Sims-ISWS)
W78-04514

MINIMUM STREAM POWER FOR RIVERS AND DELTAS,
San Diego State Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-04519

MEASUREMENT TECHNIQUES FOR COASTAL WAVES AND CURRENTS,
Coastal Engineering Research Center, Fort Belvoir, VA.
P. G. Teleki, F. R. Musialowski, and D. A. Prins.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 041, Price codes: A05 in paper copy, A01 in microfiche. Miscellaneous Report No. 76-11, November 1976. 75 p, 38 fig, 4 tab, 14 ref, append.

Descriptors: *Current meters, *Instrumentation, *Telemetry, *Waves(Water), *Ocean waves, Dye dispersion, Currents(Water), Beaches, Velocity, Tracers, *Shore processes, Sea sleds, Wave gages, Nearshore currents.

A Towed Oceanographic Data Acquisition System (TODAS) consisting of a towed platform (sea sled) with current meters and a wave gage was developed for collection of information on nearshore currents and waves. Data acquired by the sensors are telemetered to shore and digitally recorded. The system is used for real time evaluation of flow characteristics between shore and a depth of 9.14 m (30 ft). This mobile battery-operated system canbe used at remote locations. The system has been used principally in two experimental designs: (1) monitoring the distribution of longshore currents in shore-normal profiles, and (2) a combination of Eulerian-Lagrangian experiments where fixed-point metering is supported by aerial photography of diffusing dye plumes and concentration measurements of the dye tracers. (Adams-ISWS)
W78-04532

THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS,
Louisiana State Univ., Baton Rouge.
C. A. Whitehurst, W. A. Blanchard, and L. N. Doiron.
Photogrammetric Engineering and Remote Sensing, Vol 43, No 8, p 1049-1050, August, 1977. 1 fig.

Descriptors: *Marsh plants, *Infrared radiation, *Environment effects, *Soil compaction, Wetlands, Roads, Coastal marshes, Aerial photography, *Remote sensing, Louisiana, *Marsh buggy tracks, *Louisiana delta plain.

The compaction of marsh vegetation and soils by wheeled or tracked vehicles used for transportation through marshes is viewed as a serious threat to the stability of coastal wetlands. Color infrared aerial photography was used to locate and quantify the extent of the marsh buggy routes through a south Louisiana marsh. The strong delineation of the land/water interface on color IR photographs makes identification of water filled tracks easier than from conventional color plates. Qualitative estimation of the growth stage of revegetated marsh buggy tracks is also possible with color IR imagery. The younger plants are light pink in color and more mature vegetation is a dark red. (Steiner-Mass)
W78-04536

THE EFFECTS ON THE VEGETATION OF THE ADDITIONS OF INORGANIC NUTRIENTS TO SALT MARSH SOILS AT STIFFKEY, NORFOLK,
University of East Anglia, Norwich (England). School of Biological Sciences.
R. L. Jefferies, and N. Perkins.
Journal of Ecology, Vol 65, p 867-882, 1977. 7 fig, 4 tab, 13 ref.

Descriptors: *Salt marshes, *Halophytes, *Nutrient requirements, *Fertilizers, *Standing crop, Wetlands, Marshes, Coastal marshes, Tidal marshes, Marsh plants, Saline salts, Nutrients, Deficient elements, Salts, Nitrogen, Nitrogen compounds, Census, Productivity, Reproduction, Drought resistance, Sampling, Vegetation, Vegetation establishment, *Stiffkey(England), Norfolk(England), Low marsh, High marsh.

Regular additions of mineral salts have been made over a 4- or 5-year period to sites in an upper marsh at Stiffkey, Norfolk, in order to examine the effects of these salts on the composition of the vegetation and to determine whether the upper marsh was deficient in nitrogen for plant growth. In other experiments 'pulses' of inorganic nitrogen (NH4(+) or NO3(-)) were added to field plots at different times during a single growing season and the standing crop of species measured. The plant communities exhibited a strong degree of constancy towards the nutritional perturbations. However, species characteristic of the low marsh and drainage channels showed small but significant increases in frequency in plots treated with inorganic nitrogen. In the same plots Limonium vulgare, Halimione portulacoides and Suaeda maritima showed an increased allocation of resources to sexual reproduction. Armeria maritima declined in frequency in the nitrogen-treated plots, probably as a result of competition. The standing crops of different species in plots treated with 'pulses' of inorganic nitrogen with one exception were not significantly different. The relatively poor response of species to the additions of nutrients reflects their adaptation to the presence of summer drought and hypersaline conditions in the upper marsh. (Steiner-Mass)
W78-04541

GROWTH RESPONSES OF COASTAL HALOPHYTES TO INORGANIC NITROGEN,
University of East Anglia, Norwich (England). School of Biological Sciences.
R. L. Jeffries.
Journal of Ecology, Vol 65, p 847-865, 1977. 8 fig, 3 tab, 36 ref.

Descriptors: *Salt marshes, *Halophytes, *Nutrient requirements, *Nitrogen, *Standing crop, Wetlands, Marshes, Coastal marshes, Tidal marshes, Marsh plants, Saline soils, Nutrients, Deficient elements, Salts, Nitrogen compounds, Census, Productivity, Reproduction, Sea water, Sampling, Seasonal, Genetics, Stiffkey(England), Norfolk(England), Inorganic nitrogen.

Intra- and interspecific variation in growth response to inorganic nitrogen, NH4(+) or NO3(-), has been studied in halophytic species grown in sand culture. Populations of Aster tripolium, Plantago maritima, Salicornia europaea agg. and Triglochin maritima from the upper levels of a salt marsh at Stiffkey, Norfolk, have slower growth rates than corresponding populations from a low marsh. Populations of Aster tripolium and Plantago maritima from the upper marsh away from drainage channels grow slower than populations close to channels. Species characteristic of the low marsh such as Halimione portulacoides, Aster tripolium, and Suaeda maritima have fast growth rates compared with the rates of species abundant in the upper marsh such as Armeria maritima and Limonium vulgare. Although there is seasonal variation in the concentrations of soluble inorganic nitrogen in the sediments of the two marshes, the values obtained are similar for both marshes, but the upper marsh, unlike the lower marsh, becomes hypersaline in summer. It is suggested that the slower growth response to nitrogen of plants from the upper marsh away from drainage channels is the result of selection for plants with relatively low growth rates, which are able to survive the period of hypersaline stress during the summer. (Steiner-Mass)
W78-04542

THE VEGETATION OF SALT MARSHES AT SOME COASTAL SITES IN ARCTIC NORTH AMERICA,
Toronto Univ. (Ontario). Dept. of Botany.
R. L. Jeffries.
Journal of Ecology, Vol 65, p 661-672, 1977. 4 fig, 3 tab, 20 ref.

Descriptors: *Coastal marshes, *Marsh plants, *Vegetation establishment, *Polar regions, *Salinity, *Standing crop, *Ecological distribution, Wetlands, Marshes, Salt marshes, Tidal marshes, Aquatic plants, Vegetation, Shore-line cover, Coasts, Arctic, Alaska, Sea water, Biomass, Primary productivity, Distribution patterns, Pioneer stage, Succession, Bays, Inlets(Waterways), Canada, Arctic coastal marshes.

The vegetation of salt marshes was examined at seven sites on the Arctic coast of Alaska and Canada, at some of which measurements were made of the salinity of sea water, the amounts of standing crop of the vegetation and the distribution of biomass within plants. Puccinellia phryganodes, Stellaria humifusa and Cochlearia officinalis from the pioneer plant community on open coasts, but in sheltered bays and inlets, where vegetation cover is continuous, species such as Arctophila fulva, Dupontia fisheri, Hippuris tetraphylla and Carex ramenskii are frequent. The salinity of inshore sea water at most sites is very low. In this survey salinity values do not exceed 0.27 M Na(+) (about 18%). The total biomass for stands of the pioneer plants also is low (96-284 g m(-2)). The above-ground:below-ground ratios of dry matter lie between 1:0.11 and 1:3.40. A tentative estimate of the net primary production of Puccinellia phryganodes indicates that a value of 10 g m(-2) per annum appears to be an upper limit. The results are compared with similar data from Polar regions in North America and Eurasia. (Steiner-Mass)
W78-04543

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS IS EFFECTIVE METHOD FOR DESALTING WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
C. S. Crowe, and F. F. Zdenek.
Johnson Drillers Journal, Vol 49, No 6, p 6-8, November-December 1977. 1 fig.

Descriptors: *Reverse osmosis, *Desalination, *Water treatment, Distillation, Flash distillation, Electrodialysis, Economics, Costs, Energy, Arid lands.

It is often the case in arid or semi-arid regions that potential ground water supplies are vast, but are too brackish for use if left untreated. Nevertheless, it is in these regions that it becomes necessary to use this water since the cost of the treatment is still less than the expense of pumping fresh water long distances to the point of use. As energy costs increase, research and development in various desalination processes are continually turning up more economical techniques, distillation, electrodialysis, and ion exchange methods have all received study and limited use over the past few years. A fourth method, reverse osmosis, is a relatively new technology by which pump pressure overcomes natural osmotic pressure of brackish water to force pure water through a semi-permeable membrane. About 99 percent of the salt is removed while allowing water to pass freely. Cellulose acetate and polyamide are the two types of membrane used. Economic comparisons indicate reverse osmosis to be more cost effective than distillation for large operations, but additional experience is needed before these figures can be verified. (Eberle-NWWA)
W78-04297

METHOD FOR RECOVERING FRESH WATER FROM BRINE,
J. B. Maguire, Sr.
U.S. Patent No. 4,046,534, 8 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 250, September 6, 1977.

Descriptors: *Patents, *Desalination, *Desalination processes, *Water treatment, *Water purification, Water pollution treatment, Freezing, Crystallization, Nucleation, Separation techniques.

A process is disclosed for recovering fresh water from brine which includes introducing brine, which has been inoculated with a predetermined number of ice nuclei and is at about its freezing temperature, into an elongated crystal growth zone which is supplied with refrigerant along the brine flow path at a graduated rate such that more refrigerant is supplied toward the outlet of the crystal growth zone than near the inlet. Ice crystals are separated from the resulting brine-ice slurry, and the ice crystals are washed with fresh water before being melted to recover fresh water. (Sinha-OEIS)
W78-04324

POWER GENERATION AND POTABLE WATER RECOVERY FROM SALINOUS WATER,
Universal Oil Products Inc., Des Plaines IL. (Assignee).
D. B. Carson.
U.S. Patent No. 4,046,640, 8 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 281, September 6, 1977.

Descriptors: *Patents, *Desalination processes, *Saline water, Sea water, *Solar radiation, *Separation techniques, Electric power, Power-plants, Thermocline, Thermal properties, Heat exchangers.

A principal object of the invention involves the simultaneous generation of power and the recovery of potable water from a source of saline water. A corollary objective is the utilization of a combination of solar energy with the natural temperature gradients existing at varying depths of the ocean. These objects are achieved through the sequential steps of : (a) introducing saline water obtained from close to the surface of the ocean into a solar radiation heat sink (solar radiation heat sinks may take the form of flat plate collectors or a

shallow solar pond); (b) exposing the saline water to radiant solar energy for a time sufficient to raise the temperature to a level of at least about 135 degrees F; and (c) introducing the heated saline water into a series of vacuum flash separation zones, each succeeding one of which is maintained at a lower subatmospheric pressure than the preceding zone. This provides vapor phases which are utilized to vaporize hydrocarbons in separate vaporizers. The hydrocarbons vapors are passed through separate, individual turbines, or are introduced into different stages of a multistage turbine, the resulting motion from which power is generated. Potable water is recovered after condensation by contacting the vapors from the last stage with sea water. (Sinha-OEIS)
W78-04325

SIMULTANEOUS PRODUCTION OF MULTIPLE GRADES OF PURIFIED WATER BY REVERSE OSMOSIS,
Desalination Systems, Inc., Escondido, CA. (Assignee).
D. T. Bray.
U.S. Patent No. 4,046,685, 7 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 294, September 6, 1977.

Descriptors: *Patents, *Desalination, *Water purification, Water treatment, Water quality control, *Reverse osmosis, Semipermeable membranes.

A reverse osmosis apparatus comprises an elongated pressure container housing membrane semipermeable cartridges in end-to-end relationship. A separate tap from the product water collector of the semipermeable membrane cartridge or cartridges nearest the inlet of the pressure container for introduction of pressuzed feed liquid produces a high quality water product. A tap from the product water collector of the remainer of the semipermeable cartridges produces a lower quality water product. A minor amount of high quality product water and a major amount of lower quality product water may readily be produced. The process and apparatus may advantageously be employed in the second or subsequent or final step of a multistage process for converting sea water to potable water. (Sinha-OEIS)
W78-04326

RECLAMATION OF BRACKISH WATERS FOR IRRIGATION: OPTIMIZATION OF PROCESS PARAMETERS FOR FERTILIZER-DRIVEN OSMOSIS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
J. O. Kessler, and C. D. Moody.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 709, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, September 1977. 51 p, 7 ref, 2 append. OWRT B-053-ARIZ(3), 14-34-0001-7137.

Descriptors: *Osmosis, *Desalination, *Membrane processes, Separation techniques, Cost analysis, Reclamation, Agriculture, Irrigation water, Greenhouses, *Brackish water, *Optimization, Salt tolerance, Fertilizers, Direct osmosis, *Forward osmosis, *Yuma desalting plant(Ariz), *Concentration polarization.

Irrigation water can be extracted from a salt water source by fertilizer-driven forward osmosis (FDFO). The optimum design and economic utility of FDFO extractors depend on the salt concentration of the available water, the transport properties of available semipermeable membranes, the cost of membranes, associated equipment, and operating personnel, the salt tolerance of crops, and the current local value of purchased irrigation water. The operating point of an extractor is determined by setting equal the marginal cost of an increase in FDFO output and the cost of locally available purchased water. This operating point determines the overall average cost of the water extracted by FDFO, the quantity of water per fertilizer unit that can be extracted, and the fraction of the irrigation requirement that can be supplied. The results show that FDFO can extract 80 kg of water per kg of fertilizer from 3200 mg/l brackish water and 14 kg of water per kg of fertilizer from seawater. The report analyzes the feasibility of applications to controlled environment agriculture in general, and to a particular example, the proposed Yuma desalting plant. Some aspects of concentration polarization effects are also considered.
W78-04363

NEW POLYMERIC MEMBRANE CONTAINING PHOSPHONATE ESTER GROUPS FOR DESALINATION,
Gulf South Research Inst., New Orleans, LA.
I. Cabasso, and C. N. Tran.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 038, Price codes: A04 in paper copy, A01 in microfiche. Report OWRT/S--78/4, November 15, 1977. 56 p, 17 fig, 10 tab, 29 ref, 2 append. 323-827-10, 14-34-0001-6523.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, *Polymers, Chlorine, Chemical stability, Mechanical stability, Hydrogen ion concentration, Membrane processes, Desalination processes, Polyphosphonate, *Cellulose acetate, Alloy membranes, *Composite membranes.

A membrane consisting of poly(2,6-dimethyl-1,4-bromophenylene oxide) dimethyl phosphonate ester alloyed with cellulose acetate was developed and was efficient in separating salt from saline solution in the reverse osmosis process. The membrane was cast to have an asymmetric morphology. The casting solution was polyphosphonate/cellulose acetate (1/1 by weight). The membrane displayed high salt rejection, a high water permeation rate, and excellent chemical and mechanical stability. Although further characterization and development of the alloy membrane are needed, the following conclusions are valid on the basis of work completed. (1) The ring bromination of the polyphenylene oxide prior to phosphonylation proved to be a proper route for the fabrication of a membrane that is insensitive to trace quantities of chlorine. (2) The incorporation of the phosphoryl ester as a pendent group to a relatively hydrophobic polymer imparts a hydrophilicity to that polymer. The hydrophobic-hydrophilic balance can then be changed at will. (3) Composite membranes were prepared by depositing the polyphosphonate thin film on a porous support. Commerically available porous supports were insufficient when coating deposition was from an organic solvent. New porous supports that are not solvent sensitive are needed for production of reproducible composite membranes, and alternative porous substrates will be investigated to the continuation program. Alloying the PPNs with other compounds such as Ethocel or cellulose triacetate has also begun.
W78-04500

3B. Water Yield Improvement

ACCIDENTAL AND PLANNED WEATHER MODIFICATION IN ILLINOIS,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr.
Water Resources Bulletin, Vol. 13, No. 6, p 1165-1174, December 1977. 1 fig.

Descriptors: *Weather modification, *Precipitation(Atmospheric), *Illinois, Projects, Research and development, Cities, Effects, Rainfall, Hail, Agriculture, Industry, Powerplants, Climatology, Weather, Meteorology, Urban effects, Climatic changes.

Weather modification, both planned by man and that accidentally produced by man, has been under intensive study in Illinois for ten years. Most everyone in Illinois and the Midwest is living in a climate that now is modified inadvertently from its natural state. State atmospheric scientists have tackled weather modification through a series of interrelated studies beginning with climatic studies (to establish the background), experimental design studies, experimental field studies to verify changes and their causes, and finally socio-economic and environmental studies to measure the impacts of weather modification. Studies at St. Louis showed that the city acts as a trigger of summer clouds and rainfall leading to 4 to 6 summer days with 3 cm or more rain somewhere just east of the city. Power plants and jet aircraft also accidentally produce climatic changes. A focus on planned weather modification has been on the design of needed midwestern experiments in rainfall enhancement and hail suppression, including the societal and environmental impacts. (Sims-ISWS)
W78-04205

METHOD OF FORMING A SUBTERRANEAN WATER BARRIER AND A PLOW FOR USE THEREWITH,
Kabushiki Kaisha Komatsu Seisakusho, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 3F.
W78-04330

ON MELTING ICEBERGS,
Cambridge Univ. (England). Dept. of Applied Mathema jcs and Theoretical Physics.
For primary bibliographic entry see Field 2C.
W78-04515

3C. Use Of Water Of Impaired Quality

BRINE CHEMISTRY, SCALING AND CORROSION: GEOTHERMAL RESEARCH STUDY IN THE SALTON SEA REGION OF CALIFORNIA,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 8G.
W78-04303

A SALINITY MANAGEMENT STRATEGY FOR STREAM-AQUIFER SYSTEMS,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04374

SALINITY MANAGEMENT STRATEGIES FOR THE LOWER SAN LUIS REY RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04499

QUALITY ASPECTS OF AGRICULTURAL RUNOFF AND DRAINAGE,
American Society of Civil Engineers, New York. Task Committee on Agricultural Runoff and Drainage of the Water Quality.
For primary bibliographic entry see Field 5B.
W78-04523

DISTRIBUTION OF BEETLE MITES IN IRRIGATED SOILS, (IN RUSSIAN),
Odessa State Univ. (USSR).
T. F. Krutogolova.
Ekologiya 5(5), p 85-89, 1974.

Descriptors: Anoribatella-ornata, *Beetle mites, Belba-verrucosa, Ceratozetes-mediocris, Corn(Field), *Distribution, Euphthiracarus-eribrarius, Furcoribula-furcillata, Gamasid, Mites,

Oppia-nova, Oppia-obsoleta, Oppia-splendens, Potato, Soils, Tarsonid, Temperature, Wheat, Winter, Zygoribatula-frisiae, *Irrigated soils, Soil moisture.

The effect of irrigation on beetle mites (Oribatidae) of soil was studied in medium-clay chernozem soil. A total of 30 spp. of Oribatidae were found; there were even more gamasids and tarsonoids. Oribatids (26 spp.) were found in irrigated potato soil, 15 spp. in corn soil, and 13 spp. in winter wheat soil. Oppia nova and Zygoribatula frisiae were found in all sections of the soil. O. obsoleta, O. splendens, Euphthiracarus eribrarius, Belba verrucosa and Furcoribula furcillata were recorded only from the irrigated potato soil. Ceratozetes mediocris was only found in the irrigated corn soil. Z. frisiae were predominent in irrigated sections and Anoribatella ornata in unirrigated sections. The number of mites decreased from spring to summer and increased toward fall. The mite population was affected by moisture and temperature in the 0-30 cm layer by the behavior of the dominant mite species, the type of crop grown and mechanical turning of the soil. Irrigation depressed the mite population, evidently due to the resulting decrease in soil aeration.--Copyright 1977, Biological Abstracts, Inc.
W78-04673

3D. Conservation In Domestic and Municipal Use

SURFACE WATER-ESKER RECHARGE STUDY EAST LANSING-MERIDIAN TOWNSHIP, MICHIGAN,
Williams and Works, Grand Rapids, MI.
For primary bibliographic entry see Field 4B.
W78-04208

DOMESTIC WATER CONTROL UNIT,
Braukmann Armaturen A.G., Rothrist (Switzerland). (Assignee).
B. W. Braukmann, and R. Vollmer.
U.S. Patent No. 4,046,692, 6 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 296, September 6, 1977.

Descriptors: *Patents, *Domestic water, Flow control, *Filtration, Valves, *Flow rates.

This invention relates to a domestic-water control unit having connections for a supply line from the water main and a domestic water line, an inlet-pressure gauge and an outlet pressure gauge, a filter, a pressure-reducer, and a return-flow check valve. The control unit is formed of a housing containing a filter with an inlet and outlet in line above the filter, the latter forming a channel with the housing. The pressure reducer is positioned between the inlet and outlet above the filter. A rotary valve positioned between the filter and the pressure reducer reverses the flow in the unit. A plug-valve is located in the housing to provide drainage and is connected to the rotary valve so that on reversal of flow, the plug-valve opens to drain the unit. (Sinha-OEIS)
W78-04328

3E. Conservation In Industry

ENVIRONMENTAL CONSIDERATIONS AND THE MODERN ELECTROLYTIC ZINC REFINERY.
For primary bibliographic entry see Field 5D.
W78-04277

POSSIBILITIES OF TREATING ELECTROPLATING SHOP WASTE WATERS WITHOUT GENERATING SPECIAL WASTES. METAL RECOVERY IN PLACE OF SLUDGE DISPOSAL (MOEGLICHKEITEN ZUR BEHANLDLUNG GALVANISCHER ABWAESSER UNTER VERMEIDUNG VON SONDERABFAELLEN, METALLRUECKGEWINNUNG STATT SCHLAMMDEPONIE),
For primary bibliographic entry see Field 5D.
W78-04278

REDUCING POLLUTION CONTROL COSTS OF ELECTROPLATING PROCESSES,
IBM Corp., San Jose, CA. General Products Div.
For primary bibliographic entry see Field 5D.
W78-04279

CAN WETOX HANDLE SPENT SULFITE LIQUOR.
For primary bibliographic entry see Field 5D.
W78-04282

RECOVERY OF USEFUL BY-PRODUCTS FROM TEXTILE WASTES,
Shri Ram Inst. for Industrial Research, Delhi (India). Environmental Protection Cell.
For primary bibliographic entry see Field 5D.
W78-04284

AQUIFER STORAGE OF HEAT,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 4B.
W78-04292

THE PROCESS OF HEAT ACCUMULATION AND GEOTHERMAL RESOURCE FORMATION,
For primary bibliographic entry see Field 4B.
W78-04301

CONSERVATION OF WATER, CHEMICALS, AND ENERGY IN DYEING NYLON CARPET,
Georgia Inst. of Tech. Atlanta. School of Textile Engineering.
W. C. Tincher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 988, Price codes: A04 in paper copy, A01 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC 07-77, November, 1977. 61 p, 32 tab, 10 ref, 3 append. OWRT A-064-GA(1), 14-31-0001-5010.

Descriptors: *Textiles, *Water conservation, *Water reuse, *Chemicals(Dyes), Recycling, Industrial water, Dyes, *Dyeing, *Energy conservation.

Reduction in the requirements for water, energy, and chemicals have been achieved by changes in carpet beck dyeing procedures. Instead of discharging the dyebath following each dye cycle, in the new procedure the spent bath is analyzed, reconstituted to the desired concentration of dyes and auxillary chemicals, and reused. Bench scale dyeings were conducted initially to define operational parameters for coloring commerical nylon carpet a variety of shades with both acid and disperse cyes. The procedures developed were employed in pilot scale equipment for dyeing carpets with reuse of the dye bath for up to 5 dyeings before dumping. Within-sample end-to-end variations and between-sample variations in color were assessed by instrumental techniques. Results suggest that commercially acceptable carpet dyeings can be achieved in recycled dyebaths. Compared with conventional carpet beck dyeing, the modified procedures make possible savings of 65 percent in chemical costs, 64 percent in water requirements, and 20 percent in energy requirements. Reduction in quantities of chemicals required by dyeing in recycled dye baths will give a significant reduction in the quantities of materials that must be removed from the plant effluent in waste treatment facilities. This new dyeing technique has been extended to dyeing of nylon hosiery and polyester yarn. In-plant demonstrations on commercial scale equipment are planned.
W78-04370

PILOT DEMONSTRATION OF RENOVATION AND REUSE OF WASTEWATERS FROM ORGANIC CHEMICAL MANUFACTURING.
Union Carbide Corp., South Charleston, WV.
For primary bibliographic entry see Field 5D.
W78-04382

DIAMONDS ARE FOREVER, SAYS THE MAN WHO GIVES THEM NEW LIFE.
For primary bibliographic entry see Field 5G.
W78-04386

REVERSE OSMOSIS PROVIDES REUSABLE WATER FROM ELECTRONICS WASTE,
IBM Corp., Manassas, VA.
For primary bibliographic entry see Field 5D.
W78-04400

THE BUILDUP OF DISSOLVED ELECTROLYTES IN A CLOSED PAPER MILL SYSTEM,
Scott Paper Co., Philadelphia, PA.
For primary bibliographic entry see Field 5D.
W78-04407

PRECIPITATOR RECLAIMS WATER FROM WASTE STREAMS.
For primary bibliographic entry see Field 5D.
W78-04411

A PRELIMINARY REPORT ON STUDIES TO DEVELOP ALTERNATIVE METHODS OF REMOVING POLLUTANTS FROM TUNA (ALBACORE) PROCESS WASTEWATERS,
National Marine Fisheries Service, WA. Pacific Utilization Research Center.
For primary bibliographic entry see Field 5D.
W78-04430

WATER QUALITY AT FIVE PROPOSED INDUSTRIAL SITES ON THE ROANOKE AND NEW RIVERS,
Nuclear Regulatory Commission, Washington, DC. Office of Nuclear Reactor Regulation.
For primary bibliographic entry see Field 5C.
W78-04497

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 443, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/9-77-032, Executive Summary, October 1977. 12 p, 9 fig, 2 tab, 2 ref. EPA 68-01-1916.

Descriptors: *Energy, *Technology, *Resources development, *Regional development, Regional analysis, Forecasting, Environmental effects, Ecology, Montana, North Dakota, South Dakota, Wyoming, Utah, Colorado, Arizona, New Mexico, Coal mines, Oil shales, Natural gas, Transportation, Employment, Economic impact, Water quality, Public health, *Technology assessment, Uranium, Air quality.

Impacts associated with three levels of Western United States energy resource development (nominal, low demand, and low nuclear availability for 1980, 1990, and 2000) were assessed. Energy development scenarios within the eight state area

(Montana, North Dakota, South Dakota, Wyoming, Utah, Colorado, Arizona, and New Mexico) at six sites examined five development alternatives: surface and underground mining of coal; conversion and exportation of coal; surface retorting of oil shale; milling of uranium ore; conventional crude oil and natural gas production. Transportation by rail, pipeline, and extra high voltage transmission lines were combined with energy development technologies, both state-of-the-art and projected. Accordingly, site-specific and regional impacts likely to occur when Western U.S. energy resources are developed were identified and analyzed in terms of: air quality; water availability and quality; social, economic, political, and ecological impacts; and regional health effects, transportation, noise, and aesthetics. Impacts predicted include water shortages, water pollution, air pollution, and population dislocation. Policy implications are discussed in terms of required energy resource development planning, cooperation between energy developers and local governments, and improved environmental and ecological controls. (Wares-IPA)
W78-04657

3F. Conservation In Agriculture

AGROMETEOROLOGICAL STUDIES IN THE TURKMEN SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2B.
W78-04241

THE DEVELOPMENT OF METEOROLOGICAL STUDIES IN THE TURKMEN SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2B.
W78-04242

THE 1977 IRRIGATION SURVEY.
Irrigation Journal, Vol. 27, No. 6, p 19-26, November-December, 1977. 51 tab.

Descriptors: *Irrigation, *Irrigated land, *Sprinkler irrigation, Surveys, Statistics, Acreage, Irrigation wells, Pumps, Crops.

The IRRIGATION JOURNAL has published its 1977 Irrigation Survey of the United States. Information is given in a state-by-state format, and includes: (1) total irrigated acreage in each state between 1968 and 1977; (2) type of irrigation power units; (3) acreage irrigated by various methods; (4) number of irrigation wells and their average size, and; (5) acreage irrigated, broken down by crop. Overall, the survey indicates that 1977 was not a year for growth in the irrigation industry. Drought conditions, low farm commodity prices, and uncertainties in the golf course and turf markets are thought by the IRRIGATION JOURNAL staff to be the major culprits in slowing investment in irrigation equipment. Reprints of the survey are available from the Journal for $10 per copy (address: P.O. Drawer 77, Elm Grove, WI, 53122). (Eberle-NWWA)
W78-04294

WELLS RECHARGED BY GRAVITY IN AHMEDABAD,
For primary bibliographic entry see Field 4B.
W78-04295

NEW MEXICO PUMP STUDY POINTS TO FARMERS' NEED FOR EFFICIENCY KNOWLEDGE,
F. Buckingham.
Irrigation Age, Vol 12, No 4, p 34-35+, January, 1978, 3 tab.

Descriptors: *Irrigation systems, *Natural gas, *Pumping, Performance, Efficiencies, Costs, Conservation, Irrigation design, *New Mexico, Engineering.

A New Mexico irrigation pump study suggests that farmers should know more about pump efficiency and should have more expert help in selecting pumps. The study zeroed in on pumps fueled by natural gas. Results of earlier work indicate the average natural gas pumping system's efficiency is only slightly over 10%. If the average could be improved to 15%, over a million cubic feet of gas used for irrigation pumping in New Mexico could be saved. Such savings are possible through improved selection and maintenance of existing pumping plants. Because engine and pump efficiency are hard to separate, there is no easy way for a farmer to evaluate overall pumping efficiency. Researchers have found that many newly-installed pumps operate at poor efficiency, indicating widespread lack of selection practice knowledge. In the future, natural gas pumping systems will need to be much better engineered to combat inflation and avoid fuel curtailments as natural gas supplies dwindle. (Eberle-NWWA)
W78-04300

METHOD AND APPARATUS FOR REVERSIBLY POWERING A MOBILE IRRIGATION SYSTEM,
MAC Corp., San Jose, CA. (Assignee).
R. M. Sherman.
U.S. Patent No. 4,043,505, 10 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1622, August 23, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Application equipment, Pipes, Remote control, Internal combustion engine.

An improved mobile irrigating system has a centralized, internal combustion engine powered unit which may be driven in either of two directions from a control mounted at the end of a coupled line of irrigating pipes. The end-mounted control unit transmits a control signal to the centralized power unit in part through the coupled line of irrigating pipes and in part through an insulated electrical cable. (Sinha - OEIS)
W78-04311

FILTER FOR USE WITH IRRIGATION SYSTEMS,
N. Man.
U.S. Patent No. 4,043,915, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1751, August 23, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Filtration, *Irrigation efficiency, Irrigation practices, Filters.

A filter used in irrigation systems comprises a hollow screening and filtering body with inlet and outlet ports. A Venturi pipe is connected with the interior of the filter body. The screening and filtering body is placed in a casing which has an outlet. A conduit leads from the interior of the filter into a container. From the interior of that container a further conduit leads to a point substantially co-incident with the throat of the Venturi pipe. The conduit is closed at its end positioned within the container. The portion of the conduit which extends within the container is permeable to liquid. The container has a flushing inlet and a flushing outlet. The irrigation water is passed through the filter before it reaches the water dispensing or irrigation devices. (Sinha - OEIS)
W78-04316

METHOD OF FORMING A SUBTERRANEAN WATER BARRIER AND A PLOW FOR USE THEREWITH,
Kabushiki Kaisha Komatsu Seisakusho, Tokyo (Japan). (Assignee).
Y. Tamura, K. Hirosawa, and K. Ogaki.
U.S. Patent No. 4,047,387, 12 p, 15 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 962, No 2, p 530, September 13, 1977.

Descriptors: *Patents, *Water conservation, Soil treatment, *Soil sealants, *Soil water movement, Soil properties, Equipment, Plows.

A method is described for forming a horizontal barrier in situ at a preselected depth beneath the soil surface and in a plane substantially parallel to the soil surface. The barriers are made of a thermoplastic material such as asphalt and are used to improve soil having a poor water retention property. A cavity in a plow is filled with the barrier forming material. The material is spread by an ironing portion of the plow and is prevented from contact with air at all times. A pressure control means is provided on the side of a barrier forming material supply in order to maintain the amount of material being supplied. A subterranean water barrier is thus formed. (Sinha-OEIS)
W78-04330

IRRIGATED AND NONIRRIGATED SOYBEAN, CORN, AND GRAIN SORGHUM ROOT SYSTEMS,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
W. C. Mayaki, L. R. Stone, and I. D. Teare.
Agronomy Journal, Vol 68, No 3, p 532-534, May-June 1976. 1 fig, 1 tab, 4 ref. OWRT A-060-KAN(4).

Descriptors: *Root distribution, Irrigation, Irrigation effects, *Soybeans, *Corn(Field), *Grain sorghum, Furrow irrigation, Soil water, *Root systems.

Knowledge of rooting patterns of various crops is important in designing irrigation systems and assessing water extration capabilities. We investigated root depth and distribution under irrigated and nonirrigated conditions for soybeans, corn, and grain sorghum. Soil cores 6.7 cm in diam. were taken to 180 cm deep in the crop row, 1/4 row, and 1/2 row (furrow) for each crop at physiological maturity. The cores were sectioned in 30-cm increments and washed through 35-mesh screen (0.73 mm opening), and the roots oven dried. The study soil was deep, barrier-free, Muir silt loam (finesilty, mixed, mesic, Pachic Haplustoll). Approximately 71, 64, and 86% of the total root dry matter were in the upper 30 cm for irrigated soybeans, corn, and grain sorghum, respectively. Approximately 67, 39, and 79% of the total root dry matter were in the upper 30 cm for nonirrigated soybeans, corn, and grain sorghum, respectively. Only corn did not have roots in the 150 to 180-cm zone. Seasonal water uses under irrigated conditions (neglecting water flux into or from the root zone) were 65 cm, and 53 cm in soybeans, corn, and grain sorghum, respectively. Seasonal water use was approximately 44 cm by each of the three crops under nonirrigated conditions. (Skogerboe-Colorado State)
W78-04340

SOYBEAN ROOT DEVELOPMENT AND SOIL WATER DEPLETION,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
L. R. Stone, I. D. Teare, C. D. Nickell, and W. C. Mayaki.
Agronomy Journal, Vol. 68, No. 4, p 677-680, July-August 1976. 6 fig, 14 ref.

Descriptors: *Soybeans, *Root development, Soil moisture, *Soil water, Model studies, *Moisture depletion(Soils).

A field study to investigate soybean root growth and water depletion patterns was conducted. Field water depletion and rooting data are needed to assist in developing and refining models that consider root-soil-water interactions. Irrigated and nonirrigated soybeans were grown on a deep, barrier-free, Muir silt loam. Soil water content, determined using neutron moderation, was used to calculate water depletion rates. Soil water content and desorption curves were used to estimate soil water potential. Available soil water was estimated using--15 bars soil water potential as the lower limit of availability. We collected soil volumes 76 cm wide, 7.6 cm thick, and 180 cm deep and washed roots free using a 35-mesh screen. During the first half of out study, maximum root and water depletion depths were nearly equal. Later, water depletion tended to be about 15 cm deeper than root growth (possibly as a result of upward water movement into the water-depleted root zone. (Skogerboe-Colorado State)
W78-04341

AN APPLICATION OF INTERACTIVE MULTIOBJECTIVE WATER RESOURCES PLANNING,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-04476

DRAIN DISCHARGE FROM A LEVEL AGRICULTURAL WATERSHED,
Guelph Univ. (Ontario). School of Engineering.
For primary bibliographic entry see Field 4D.
W78-04522

SOIL WATER FLOW AND DISTRIBUTION IN HORIZONTAL AND VERTICAL DIRECTIONS AS INFLUENCED BY INTERMITTENT WATER APPLICATION,
Fruit and Fruit Technology Research Inst. Stellenbosch (South Africa).
For primary bibliographic entry see Field 2G.
W78-04528

EFFECT OF FERTILIZERS AND COMBINED PLOWING ON THE PROTECTION OF SOD-PODZOLIC SOILS FROM EROSION, (IN RUSSIAN),
Central Inst. Agrochemistry Service, Moscow (USSR).
For primary bibliographic entry see Field 2G.
W78-04598

A FIELD STUDY OF THE AGRICULTURAL USE OF SEWAGE SLUDGE: I. EFFECT ON CROP YIELD AND UPTAKE OF N AND P,
Ball State Univ., Muncie, IN. Dept. of Natural Resources.
For primary bibliographic entry see Field 5E.
W78-04609

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

HYDROLOGIC CONSIDERATIONS OF THE UPPER ST. JOHNS RIVER BASIN, FLORIDA,
Florida State Dept. of Environmental Regulation, Tallahassee.
For primary bibliographic entry see Field 2E.
W78-04204

APPLICATIONS OF REMOTE SENSING TECHNIQUES TO COUNTY LAND USE AND FLOOD HAZARD MAPPING,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7C.
W78-04215

FEASIBILITY STUDY FOR DYKE MARSH DEMONSTRATION AREA, POTOMAC RIVER, VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
M. R. Palermo, and T. W. Zeigler.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 524, Price codes: A07 in paper copy, A01 in microfiche. Technical Report D-76-6, November 1976. 20 fig, 5 tab, 24 ref, 2 append.

Descriptors: *Dredging, *Virginia, *Spoil banks, *Marshes, Wetlands, Construction, Dikes, Sediments, Hydraulic structures, Weirs, Sluices, Rivers, Environment, Habitats, Engineering, Civil engineering, Estuaries, *Containment facilities, *Dyke Marsh(Va), *Potomac River, Dredged materials.

Results of an investigation conducted to determine the engineering feasibility of using dredged material to expand an existing marshland area were presented. Dredged material obtained from maintenance dredging operations was found suitable for use as marsh substrate, and site conditions were found adequate for construction of a containment facility. Factors evaluated in the study included site-specific feasibility of marsh expansion using dredged material, sizing of the demonstration area to meet water quality and storage needs, preliminary design of the containment facility, procedures for placement of dredged material, and identification of alternative construction methods, materials, and costs. Overall feasibility of marsh expansion was demonstrated, and additional investigations were recommended for the project. (Sims-ISWS)
W78-04216

CENTRAL AVALANCHE HAZARD FORECASTING- INTERIM REPORT, PHASE II,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2C.
W78-04219

UTILITY OF A SCANNING DENSITOMETER IN ANALYZING REMOTELY SENSED IMAGERY,
National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.
For primary bibliographic entry see Field 7B.
W78-04220

AN ERTS-1 INVESTIGATION FOR LAKE ONTARIO AND ITS BASIN,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 2H.
W78-04230

AUTOMATED GREAT LAKES WAVE FORECASTS,
National Weather Service, Silver Spring, MD. Techniques Development Lab.
For primary bibliographic entry see Field 2H.
W78-04235

THE EFFECT OF THE FAKA UNION CANAL SYSTEM ON WATER LEVELS IN THE FAKAHATCHEE STRAND, COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04249

FLOOD-FREQUENCY ANALYSIS FOR SMALL NATURAL STREAMS IN GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-04257

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04266

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04267

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04268

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, CA. Water Resources Div.
Water-Data Report CA-76-2, October 1977. 499 p, 3 fig, 1 tab.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Pacific Slope basins(Calif).

Volume 2 of water resources data for the 1976 water year for most of the Pacific Slope basins in California consists of records of stage, discharge, and water quality of streams and wells; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 173 gaging stations, stage and contents for 20 lakes and reservoirs, water quality for 119 stations and 17 wells, and water levels for 25 observation wells. Also included are 20 crest-stage partial-record stations and 8 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collction program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W78-04269

COSTS AND PRODUCTIVITY IN HARVESTING OF AQUATIC PLANTS,
Wisconsin Univ.-Madison. Dept. of Agricultural Engineering.
R. G. Koegel, D. F. Livermore, and H. D. Bruhn.
Journal of Aquatic Plant management, Vol 15, p 12-17, June 1977. 5 fig, 4 tab. OWRT A-050-WIS(2), NSF-RANN GI-39133.

Descriptors: *Aquatic weed control, *Costs, *Harvesting, Mechanical control, Wisconsin, Equipment, Lakes, Efficiencies, *Madison(WI), *Dane County(WI), Grinwald-Thomas Harvester, Aquamarine Trio Harvester.

Harvesting has been the principal method of nuisance aquatic plant control on the Madison area lakes of southern Wisconsin since 1965, carried out by the City of Madison, and, more recently, by Dane County. Costs and productivity of two harvesting systems used by the county are presented: (1) a Grinwald-Thomas Harvester was modified to include a forage chopper on the harvester deck from which plants are continuously conveyed to a transport barge coupled to the harvester; the filled barge proceeds to shore for unloading, while an empty barge is coupled to the harvester. (2) In the Aquamarine Trio system, cut vegetation is tranferred to a barge at intervals, and then transported to shore. A shoreline conveyor moves the plants to a waiting truck. Conveyor mesh covering the decks of both harvester and barge permit mechanical loading and unloading of harvested vegetation. Both harvesters are driven by hydraulically-powered paddle wheels, and employ reciprocating cutter bars ahead of inclined porous elevating conveyors. Maneuverability of the Ginwald-Thomas unit is severely limited by the attached barge, and the unit is used primarily for cutting long narrow weed beds parallel to shore. This machine harvested an average of 0.94 acres/hr (ave. of 5,930 lbs/hr) at an ave. harvesting cost of $64/hr or $68/acre. Machine 2 harvested 0.63 acres/hr (3,525 lgs/hr) at a cost of $59/hr or $94/acre. Prorated investment costs were included in these figures. (Lynch-Wisconsin).
W78-04338

GROUNDWATER AND SURFACE WATER IN THE PERMAFROST REGION,
For primary bibliographic entry see Field 2C.
W78-04352

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 3, STATISTICS OF MEAN ANNUAL FLOW,
Department of the Environment, Ottawa, (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2E.
W78-04356

AN APPLICATION OF INTERACTIVE MULTIOBJECTIVE WATER RESOURCES PLANNING,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-04476

APPLICATION OF STOCHASTIC METHODS IN WATER RESOURCES STUDIES,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W78-04484

WATER RESOURCES PLANNING (AN ILLUSTRATION ON MANAGEMENT OF SURFACE AND GROUNDWATERS),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04487

APPLICATION OF STATISTICAL DECISION THEORY,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6A.
W78-04488

PARAMETER REGIONALIZATION AND NETWORK DESIGN,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04489

PREDICTING POLLUTANT DISPERSION IN RIVERS,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-04495

EFFECT OF MOWING TIMES ON REGENERATION OF REED AND REEDMACE GROWTHS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Rostov-na. Donu (USSR).
A. G. Shekhov.
Gidrobiol Zh. 10(3), p 61-65, 1974.

Descriptors: Growth rates, Limans, Mowing, Phragmites-Communis, *Reed, *Reedmace, Regeneration, Typha-angustifolia, USSR, *Harvesting(Aquatic plants).

Experiments established that 2-fold mowing of reed (Phragmites communis) and lesser reedmace (Typha angustifolia) is most effective for controlling overgrowth of water bodies by these plants. The 1st mowing should begin when the shoots appear above water and the 2nd 20-30 days later. In this case the reed and reedmace in the Kuban limans (USSR) almost ceased to grow back for 4-5 yr.--Copyright 1975, Biological Abstracts, Inc.
W78-04524

ON THE TIME TO FIRST OVERFLOW IN DAMS WITH INPUTS FORMING A MARKOV CHAIN,
Stanford Univ., CA. Dept. of Operations Research.
For primary bibliographic entry see Field 8B.
W78-04535

COASTAL WETLANDS ALONG LAKE ONTARIO AND THE ST. LAWRENCE RIVER IN JEFFERSON COUNTY, NEW YORK,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 2H.
W78-04546

4B. Groundwater Management

SURFACE WATER-ESKER RECHARGE STUDY EAST LANSING-MERIDIAN TOWNSHIP, MICHIGAN,
Williams and Works, Grand Rapids, MI.
J. C. Sutherland, and R. M. Bruce.
Water Resources Bulletin, Vol. 13, No. 6, p 1215-1225, December 1977. 6 fig, 2 tab, 2 ref.

Descriptors: *Groundwater, *Recharge, *Municipal water, *Water supply, *Michigan, Artificial recharge, Pit recharge, Groundwater recharge, Recharge ponds, Rivers, Wells, Water wells, Water resources, Recreation, Economics, Cost analysis, Cost comparisons, Water supply development, *East Lansing-Meridian Township(Mich).

The East Lansing-Meridian Water and Sewer Authority studied a sand-gravel esker near the existing water treatment plant to determine its potential as an independent surface water supply. The nearby Red Cedar River also was investigated as a possible source of water for immediate treatment or for recharge of the esker. Although the bedrock aquifer (Grand River and Saginaw Formations) yields water adequate for the next 20 years, potential savings in treatment (hardness, iron) and pumping costs, estimated at $30,000 per year for present demand of 5 MGD, are attractive incentives for a surface water-esker recharge program. Operation savings also would be realized by constructing additional bedrock wells in new areas. The river-esker-recharge and new wellfield alternatives were compared for cost-effectiveness. Land costs make the recharge alternative more expensive. The land is undeveloped suburban property with potential for recreational use in conjunction with water supply. More places of outdoor retreat and aesthetics are needed in the Lansing Metropolitan area. A portion of the land costs would have to be borne by these or other interests for the river recharge scheme to be economically feasible. (Sims-ISWS)
W78-04208

GROUND-WATER APPRAISAL OF THE PINELAND SANDS AREA, CENTRAL MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
J. O. Helgesen.
Water-Resources Investigations 77-102 (open-file report), 1977. 49 p, 19 fig, 3 plates, 4 tab, 21 ref.

Descriptors: *Groundwater resources, *Aquifers, *Hydrologic budget, *Mathematical models, *Minnesota, Forecasting, Groundwater availability, Irrigation, Drawdown, Water yield, Aquifer characteristics, Sand aquifers, Groundwater recharge, Precipitation(Atmospheric), Surface-groundwater relationships, *Pineland Sands(Central Minnesota), *Outwash plains.

The Pineland Sands area consists of about 770 square miles of surficial glacial outwash which is undergoing increasing ground-water development for irrigation. The aquifer material is commonly very fine sand to fine gravel. Grain size and thickness generally increase from south to north. Test augering and pumping tests indicate that well yields exceeding 1,000 gallons per minute can be expected in about 15 percent of the study area, mostly in the northern part. Water in the aquifer is of the calcium bicarbonate type and is chemically suitable for irrigation. The average water budget for the aquifer involves inflow and outflow of about 295 cubic feet per second. Most recharge to the aquifer is directly from precipitation and most discharge is base flow to streams and lakes. Mathematical-modeling results show that much of the aquifer system can safely support long-term, large-scale withdrawals. Most pumpage would be derived from intercepted base flow to streams. (Woodard-USGS)
W78-04246

GROUND-WATER RESOURCES OF THE RIVIERA BEACH AREA, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
L. F. Land.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 377, Price codes: A03 in paper copy, A01 in microfiche.
Water-Resources Investigations 77-47, September 1977. 38 p, 23 fig, 4 tab, 6 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Florida, Water supply, Water levels, Hydrogeology, Water wells, Saline water intrusion, Evaluation, Palm Beach County(Fla), *Riviera Beach(Fla).

The so-called 'shallow aquifer' composed chiefly of sand, shells, sandstone, and limestone, is the principal source of freshwater in the Riviera Beach area, Fla. The major water-bearing zone consists of cemented layers of sand and shells, about 100 ft thick, in the lower part of the aquifer. The quality of the water in the shallow aquifer is generally suitable for public supply except locally along C-17 Canal where the dissolved solids concentration exceeds 500 milligrams per liter. The configuration of the water table is greatly influenced by Lake Worth, C-17 Canal, West Palm Beach water catchment area, rainfall, and municipal pumpage. The major threat to development of water supplies, and possibly to the continuation of a current withdrawal rate of over 5 mgd, is seawater (Lake Worth), but the combined effects of increased pumpage, reduced recharge resulting from increased land development, and below normal rainfall, have caused seawater to advance inland in the aquifer. Additional supplies could be developed to the west. (Woodard-USGS)
W78-04247

SALINE-WATER INTRUSION IN THE FLORIDAN AQUIFER IN THE FERNANDINA BEACH AREA, NASSAU COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
R. W. Fairchild, and C. B. Bentley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 015, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 77-32, September 1977. 27 p, 13 fig, 9 ref.

Descriptors: *Drawdown, *Artesian aquifers, *Saline water intrusion, *Pumping, *Water supply, Florida, Water wells, Hydrology, Groundwater movement, Water levels, Data collections, Water quality, Chlorides, Evaluation, Water pollution control, Nassau County(Fla), *Floridan aquifer, Fernandina Beach area(Fla).

The Floridan aquifer is the major source of water for municipal and industrial use in northeastern Nassau County, Florida. Pumpage from the aquifer at Fernandina Beach has created a cone of depression in the potentiometric surface which is at or below sea level in a 35-square mile area. Since 1880 water levels have declined more than 120 feet near the center of pumping, and chloride concentrations have increased from about 20 to a maximum of 800 milligrams per liter in some deep wells. The saline water probably is connate water which comes from zones below 1,250 and 2,000 feet. Several alternate methods to control the migration of saline water are discussed. (Woodard-USGS)
W78-04248

THE EFFECT OF THE FAKA UNION CANAL SYSTEM ON WATER LEVELS IN THE FAKAHATCHEE STRAND, COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
L. J. Swayze, and B. F. McPherson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 670, Price codes: A02 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 77-61, September 1977. 19 p, 9 fig, 1 tab, 7 ref.

Descriptors: *Florida, *Canals, Effects, *Groundwater, *Water levels, Surface waters, Flow rates, Aquifers, Inflow, Impounded waters, Groundwater movement, Surface drainage, Environmental effects, Water management(Applied), Collier County(Fla), *Faka Union Canal System(Fla), *Fakahatchee Strand(Fla), *Big Cypress Swamp(Fla).

The Faka Union Canal system, constructed in the western Big Cypress Swamp, Fla., in the early 1970's, lies about 3.5 miles west of the centerline of the Fakahatchee Strand, a forested water course which the State of Florida has designated as an Area of Critical State Concern in order to conserve natural resources. Between 1970 and 1975 the canal system annually discharged to the Gulf of Mexico from 143,200 to 275,600 acre-feet of freshwater. Discharge lowered ground-water levels as much as 4 feet near the eastern canal and created a water-level gradient that indicates water flowed from the Fakahatchee Strand west toward the canal during most of the year. In June 1975, water from early summer rains was impounded in the eastern canal upstream of the control structure at Janes Scenic Drive, and, as water levels rose in this reach, water flowed from the canal into the aquifer and around the control structure. The annual low-water level in the center of the Fakahatchee Strand declined from nearly 3 feet above mean sea level in 1972 to 1 foot above mean sea level in 1974. (Woodard-USGS)
W78-04249

A DIGITAL MODEL OF THE FLORIDAN AQUIFER, NORTH OF TAMPA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-04251

GROUND-WATER BASIC DATA FOR MORTON COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04252

GROUND-WATER RESOURCES OF GRIGGS AND STEELE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
J. S. Downey, and C. A. Armstrong.
North Dakota County Ground-Water Studies 21--Part III, and North Dakota Geological Survey Bulletin 64--Part III, Bismarck, 1977. 33 p, 9 fig, 2 plates, 2 tab, 51 ref.

Descriptors: *Groundwater resources, *North Dakota, *Aquifer characteristics, *Water yield, *Water quality, Chemical properties, Water supply, Groundwater availability, Hydrogeology, Water wells, Water level fluctuations, Data collections, Maps, Hydrographs, Water utilization, Griggs County(N Dak), Steele County(N Dak).

Griggs and Steele Counties, in east-central North Dakota, are underlain by bedrock of Ordovician, Jurassic, and Cretaceous eggs. The Fall River and Lakota Formations of Cretaceous age form the Dakota aquifer. The fractured upper part of the Pierre Formation (shale), also of Cretaceous age, forms another bedrock aquifer. The Dakota aquifer, which consists mainly of interbedded shale and sandstone units, may yield as much as 500 gpm (gallons per minute) of sodium sulfate water to wells at selected locations. The Pierre aquifer yields from 1 to 10 gpm of sodium bicarbonate or sodium sulfate water to wells. Four major glacial-drift aquifers are in the study area. The Spiritwood aquifer system may supply as much as 1,500 gpm of water to wells. Water samples contained dissolved-solids concentrations ranging from 244 to 9,800 mg/liter. The Galesburg aquifer will yield as much as 1,000 gpm of water to wells. Water samples contained dissolved-solids concentrations ranging from 317 to 2,170 mg/liter. The McVille aquifer will yield as much as 500 gpm to wells. Water samples contained dissolved-solids concentrations ranging from 449 to 2,200 mg/liter. The Elk Valley aquifer could yield 30 gpm to wells. Water samples contained dissolved-solids concentrations ranging from 397 to 2,890 mg/liter. Six communities in the project area use ground-water supplies. Rural water districts are being developed in the two-county area that will provide dependable ground-water supplies for many farms and small municipalities. The Spiritwood aquifer system and the McVille and Galesburg aquifers are capable of supplying the water needs of these districts and could also provide water for irrigation. (Woodard-USGS)
W78-04253

GROUND-WATER RESOURCES OF CAVALIER AND PEMBINA COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
R. D. Hutchinson.
North Dakota County Ground-Water Studies 20--Part III, and North Dakota Geological Survey Bulletin 62--Part III, Bismarck, 1977. 68 p, 27 fig, 3 plates, 6 tab, 59 ref.

Descriptors: *Groundwater resources, *North Dakota, *Aquifer characteristics, *Water yield, *Water quality, Chemical properties, Water supply, Groundwater availability, Hydrogeology, Water wells, Data collections, Water level fluctuations, Maps, Hydrographs, Water utilization, Cavalier County(N Dak), Pembina County(N Dak).

Cavalier and Pembina Counties, N. Dak., are underlain by bedrock of Precambrian, Ordovician, Silurian, Devonian, Mississipian, Triassic and Jurassic, and Cretaceous ages. The principal bedrock aquifers are the Cretaceous Dakota Group and the Pierre Formation. The Dakota aquifer consists of sandstone with interlayered shale and may yield as much as 500 gpm (gallons per minute) locally to individual wells. The Pierre aquifer, which consists of fractured shale, generally does not yield more than 10 gpm. Water from both aquifers is of poor quality, but is extensively utilized. The pre-Dakota bedrock aquifers yield a highly mineralized sodium chloride type water. Yields greater than 500 gpm may be available locally from the Ordovician carbonate-rock aquifers. The Munich aquifer, located in southwestern Cavalier County, is the most productive glacial-drift aquifer. It is capable of yielding slightly saline sodium sulfate type water at rates up to 500 gpm. Pembina County contains four major glacial-drift aquifers. The Pembina River aquifer yields calcium magnesium bicarbonate water at rates up to 250 gpm. The Icelandic, Pembina Delta, and Hamilton aquifers are each capable of yields up to 50 gpm. Water from the Icelandic and Pembina Delta aquifers is a calcium magnesium bicarbonate type, but the Hamilton aquifer yields sodium chloride water. Several smaller aquifers will supply relatively small quantities of good to poor quality water. A large saline soil area and small saline lakes are located in eastern Pembina County as the result of natural discharge from a regional ground-water flow system. The total ground-water pumpage in 1970 averaged an estimated 1.3 million gallons per day. (Woodard-USGS)
W78-04254

GROUND-WATER LEVELS IN THE UNITED STATES, 1973-74. NORTHEASTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202, Price $2.50. Water-Supply Paper 2164, 1977. 126 p, 14 fig.

Descriptors: *Water levels, *Groundwater, *Water wells, *Well data, *Northeast US, Measurement, Basic data collections, Aquifers, Connecticut, Delaware, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont.

This report was prepared from ground-water levels measured during 1973-74, by the U.S. Geological Survey in cooperation with the States of Connecticut, Delaware, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jer-

sey, New York, Ohio, Pennsylvania, Rhode Island, and Vermont, and with other agencies. Water-level measurements in wells are given in feet with reference to either mean sea level or land-surface datum. Mean sea level is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The height of the measuring point above or below land-surface datum is given in each well description. (Woodard-USGS)
W78-04255

GEOHYDROLOGY OF NORTH EASTERN PROVINCE, KENYA,
Geological Survey, Reston, VA. Water Resources Div.
W. V. Swarzenski, and M. J. Mundorff.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $3.30. Water-Supply Paper 1757-N, 1977. 68 p, 3 fig, 5 plates, 13 tab, 27 ref.

Descriptors: *Water resources development, *Africa, *International commissions, *Available water, *Hydrogeology, Data collections, Hydrologic data, Groundwater resources, Boreholes, Groundwater availability, Water quality, Surface waters, Water storage, Ponds, Reservoirs, Dug wells, Water supply, Livestock, Range management, Foreign countries, Maps, Rainfall, Discharge(Water), Geologic units, Aquifers, *Kenya, Agency for International Development.

The Government of Kenya, with international assistance, has been engaged since 1968 in a long-term project to develop the livestock resources of the country. Under the first phase of the project, a cooperative agreement between Kenya's Ministry of Agriculture and the U.S. Agency for International Development provided for a survey to evaluate the water resources of the North Eastern Province. This report largely concerned with ground water, is based on the findings of the water-resources investigation undertaken under Phase I (1968-73) of the project. The North Eastern Province of Kenya is a perennially water-deficient region of about 127,000 square kilometers. There are no perennial streams within the province, and water supplies for livestock, villages, and small municipalities are obtained from natural ponds, reservoirs, shallow dug wells, and boreholes. An important aspect of the livestock development project is management of the range to mitigate overgrazing; measures employed are pasture rotation and installation of additional temporary and permanent watering points. In the Mado Gashi-Kalalut range management pilot study, in an area of 7,300 square kilometers located in the western part of the province, 66 small and large reservoirs individually storing from a few hundred to as much as 40,000 cubic meters of water, and 10 boreholes have been constructed under the project. In addition, the geohydrologic data provided by about 75 boreholes, drilled elsewhere in the province for range management or public supply, provided the basis for delineating zones of fresh and saline ground water and permitted a reconnaissance evaluation of the occurrence of ground water in most of the North Eastern Province. (Woodard-USGS)
W78-04256

SUMMARY OF BASIC HYDROLOGIC DATA COLLECTED AT COSO HOT SPRINGS, INYO COUNTY, CALIFORNIA,
Geological Survey, Luguna Niguel, CA. Water Resources Div.
W. R. Moyle, Jr.
Open-file report 77-485, September 1977. 93 p, 2 fig, 1 plate, 6 tab, 103 ref.

Descriptors: *Geothermal studies, *Hot springs, *Hydrologic data, *Water temperature, *California, Chemical analysis, Water quality, Well data, Water levels, Water users, Water utilization, Steam, Thermal springs, Thermal properties, Flow rates, *Coso Hot Springs(Calif), Inyo County(Calif).

More than 200 wells and springs were visited within a 20-mile radius of Coso Hot Springs, Calif. Hydrologic and geothermal data were collected for each well or spring site. The data includes depth, chemical quality, temperature and specific conductance of water, quantity of flow, well construction, and well logs. These data show that the normal temperature gradient in the ground is about 1.1 degrees Celsius (2 degrees Fahrenheit) per 100 feet. The temperature gradient in the thermal areas is as high as 24.4 degrees Celsius (44 degrees Fahrenheit) per 100 feet. The highest temperature measured for all the wells and springs was 142.2 degrees Celsius (288 degrees Fahrenheit). The chemical quality of water in the study area is generally good except in areas where water evaporates from land surface at Owens Valley playa or where steam escapes into the atmosphere from land surface. Computerized hydrologic and geothermal data are being stored for future use at the U.S. Geological Survey office, Laguna Niguel, Calif. (Woodard-USGS)
W78-04258

GEOCHEMICAL EFFECTS OF RECHARGING THE MAGOTHY AQUIFER, BAY PARK, NEW YORK, WITH TERTIARY-TREATED SEWAGE,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-04261

GEOLOGY AND WATER RESOURCES OF THE NORTHERN PART OF THE JUDITH BASIN, MONTANA,
Geological Survey, Billings, MT. Water Resources Div.
R. D. Feltis.
Montana Bureau of Mines and Geology Bulletin 101, 1977. Montana College of Mineral Science and Technology, Butte, 65 p, 13 fig, 2 plates.

Descriptors: *Groundwater resources, *Hydrogeology, *Water quality, *Groundwater recharge, *Montana, Streamflow, Low flow, Chemical analysis, Aquifer characteristic, Groundwater movement, Water level fluctuations, Water supply, Domestic water, Irrigation, Precipitation(Atmospheric), *Judith River basin(Mont).

Northern Judith Basin contains artesian sandstone and limestone aquifes and is part of the hydrologic system of Judith Basin in central Montana. Sandstone aquifers supply water suitable for domestic and stock use; however, deeper undeveloped limestone aquifers are potential sources of water for irrigation and industry. Recharge to the aquifers is mostly from infiltration of precipitation and runoff in the foothills and mountains surrounding Judith Basin. Streamflow measurements along a stream crossing the cavernous limestone of the Madison Group in the Little Belt Mountains showed a streamflow loss of 164 cfs. In northern Judith Basin the depth to the Madison ranges from 1,965 to 3,748 feet below land surface. Oil wells have flowed water the limestone or recorded pressure heads higher than land surface. The quality of water in the Madison is poorly known; water entering the limestone contains less than 300 mg/liter dissolved solids. Water samples from the upper part of the limestone from an oil well 20 miles from the recharge area contained 4,020 mg/liter. The Judith River is the eastern boundary of the area and the mean-annual flow near the headwaters is 38,820 acre-feet and has ranged from 6,340 to 102,000 acre-feet. During 1970 water year, a year of above-average streamflow, the total streamflow of the Judith River, including principal streams from southern and eastern Judith Basin, was about 470,000 acre-feet.
W78-04263

APPROXIMATE AREAS OF RECHARGE TO THE CHICOT AND EVANGELINE AQUIFER SYSTEM IN THE HOUSTON-GALVESTON AREA, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04264

WATER-LEVEL CHANGES IN THE NORTHERN HIGH PLAINS OF COLORADO, 1964 TO 1976 AND 1972 TO 1976,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04265

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04266

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04267

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04268

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-04269

NWWA RESEARCH FACILITY: AN OVERVIEW.
Water Well Journal, Vol 32, No 2, p 44-45, February, 1978.

Descriptors: *Groundwater, *Research facilities, *Libraries, National Water Well Association.

The National Water Well Association's Research Facility is dedicated to the advancement of all knowledge which could result in the development of protection of the world's ground water resources. Objectives of the NWWA Research program are: (1) to help answere the public's questions about wells and ground water supply; (2) to assist consultants, engineers, and contractors who have problems related to ground water and

well technology; (3) to help state and federal agencies develop codes and regulations for ground water pollution control and water well construction; (4) to advise private and governmental agencies in ground water research, and; (5) to undertake research projects that touch upon all aspects of ground water science. In addition, the Research Facility's library is currently expanding its collection and is now aiding the scientific community through literature searches and loan of materials. Major projects of the facility, both past and present, are also listed in this overvies. (Eberle-NWWA)
W78-04289

A LOOK AT GROUND WATER RESEARCH.
For primary bibliographic entry see Field 2F.
W78-04290

REGIONAL GEOLOGY SERIES: PART 1, GLACIATED APPALACHIAN REGION,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-04291

AQUIFER STORAGE OF HEAT,
Auburn Univ., AL. Water Resources Research Inst.
F. J. Molz, and J. Warman.
Water Well Journal, Vol. 32, No. 2, p 45-47, February, 1978.

Descriptors: *Heat storage wells, *Aquifers, *Heated water, *Energy, Injection wells, Cooling water, On-site investigations, Environmental effects.

Researchers from Auburn University are conducting the world's first field experiments on the conservation of thermal energy by storing it as hot water in an artesian aquifer for later recovery. Such procedures for the storage and use of energy may be particularly applicable to the utilization of cooling water from power plants. This research was initially funded by the USGS in order to obtain field data to verify mathematical predictive models. Additional funding was provided by ERDA to expand the scope of the study to include practical problems likely to be encountered in the operation of a commercial facility for storage and recovery of energy. A 200-ft. deep heat storage well was drilled at the site along with 10 temperature monitoring wells. A thermal recovery factor of 0.68 has been obtained, considered encouraging by the researchers. A preliminary report on the study voices some concern about suspended solids in injected water, swelling clays in the aquifer, ground water drift, avoidance of excessive injection pressure, and the effects of storing higher-temperature water. (Eberle-NWWA)
W78-04292

THE 1977 IRRIGATION SURVEY.
For primary bibliographic entry see Field 3F.
W78-04294

WELLS RECHARGED BY GRAVITY IN AHMEDABAD,
S. K. Gupta.
Johnson Drillers Journal, Vol. 49, No. 6, p 4-5, November-December, 1977. 1 fig.

Descriptors: *Artificial recharge, *Siphons, Groundwater, Injection wells, Artesian wells, Monsoons, *India(Ahmedabad).

An unusual system for artificial recharge to utilize water available from the Sabarmati river during periods of excess flow has been put into practice for the city of Ahmedabad, India. In effect, a siphon is used to take water from the water-table aquifer on the bank of the river and deliver the water into an injection well penetrating nearby artesian strata which furnish 90 percent of the city's water supply. The recharge water is obtained from a relatively shallow well about 21 meters deep. The siphon arrangement conducts water to the 238 meter recharge well by gravity flow without the use of a pump. The water level in the supply well is of such height to permit the siphon to work only when the river carries excess water during the monsoon rains which occur from June to October. The system is metered and utilizes a control valve. Recharge was begun on May 20, 1977, and has continued uninterrupted without the aid of any external energy source. (Eberle-NWWA)
W78-04295

NEWER TECHNIQUES AID SEARCH FOR GROUND WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 7B.
W78-04296

THE PROCESS OF HEAT ACCUMULATION AND GEOTHERMAL RESOURCE FORMATION,
W. H. Austin, Jr.
Canadian Mining Journal, Vol. 98, No. 10, p 36-40, October, 1977. 4 fig, 2 tab.

Descriptors: *Geothermal reservoirs, *Thermal waters, Heat flow, Mantle, Rift zones, Intrusions, Convection, Faults(Geology), Silicates, Remote sensing, Geophysics, Thermal powerplants, Costs.

A possible scenario for the formation of a geothermal resource area in the western U.S. might be as follows: (1) upward bulge of mantle aong plate boundary or rift zone; (2) heat flow from linear matle bulge causes localized melting at regular intervals along the plate boundary, rift, or fault zones, in turn causing formation of a series of batholithic zones which are either adjacent or overlapping along the zones of weakness; (3) differentiation causes upper portions of these melt areas to form acid intrusive rocks, with either continue moving upward or become mobile and detach from parent zone; (4) absorption of water, formation of plugs and stocks as intrusion continues; (5) extensive volcanic activity resulting in collapse of dome(s) formed by intrusion(s). Enormous quantities of hydrothermal fluids released to lost rock during cooling of intrusions;)6) convection currents in fractured rocks above intrusives from a carbonate or silicate seal, ultimately enclosing a geothermal reservoir. The article closes with discussion of the huristics of geothermal exploration, suggesting a step by step approach incorporating infrared, photographic, geochemical, heat flow, aeromagnetic, seismic, and surface electrical analyses. Costs of thermal powerplant development are briefly commented upon. (Eberle-NWWA)
W78-04301

LIMITATIONS OF BANK-STORAGE MODEL ASSUMPTIONS,
Missouri Univ.- Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-04335

GROUNDWATER AND SURFACE WATER IN THE PERMAFROST REGION,
For primary bibliographic entry see Field 2C.
W78-04352

A SALINITY MANAGEMENT STRATEGY FOR STREAM-AQUIFER SYSTEMS,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04374

WATER RESOURCES PLANNING (AN ILLUSTRATION ON MANAGEMENT OF SURFACE AND GROUNDWATERS),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04487

HYDROGEOLOGY AND DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN NORTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-04496

SALINITY MANAGEMENT STRATEGIES FOR THE LOWER SAN LUIS REY RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04499

APPLICATION OF THE DRILL-STEM TEST TO HYDROGEOLOGY,
Research Council of Alberta, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 8B.
W78-04508

CYCLIC STORAGE, WHERE ARE YOU NOW,
H. E. Thomas.
Ground Water, Vol 16, No 1, p 12-17, January-February 1978. 20 ref.

Descriptors: *Groundwater, *Artificial recharge, *Water storage, *California, Groundwater recharge, Water resources, Water supply, Water resources development, Dams, Reservoirs, Irrigation, Droughts, Water demand, Water policy, Water management(Administrative), Water rights, Hydrology, Geohydrology, Cyclic storage.

This paper presented 10 theses summarizing: the cyclic pattern of precipitation and runoff in the Central Valley of California and the need for cyclic storage to insure regularity and continuity in water supply; the inadequacy of surface water storage because of evaporation losses and probable interference with groundwater recharge; the blasted hopes of Federal and State water agencies for control and management of the groundwater reservoir, because of potential conflict with private property rights; the artificial recharge by private and local enterprise; increasing emphasis in Federal and State programs upon surface reservoirs at increasing cost in money and water; the tendency of Federal policy to focus on the needs and clamors for irrigation water, with subsidies; and the availability of water from Federal projects now under construction for artificial recharge and subsurface storage, a first step to a long-range program of cyclic storage. (Sims-ISWS)
W78-04509

HYDRAULIC CONDUCTIVITY MEASUREMENTS UTILIZING HEAT-SHRINKABLE TUBING,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 8G.
W78-04510

HYDROLOGY OF TWO SMALL WETLAND BASINS IN EASTERN MASSACHUSETTS,
Lowell Univ., MA. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2H.
W78-04539 .

GROUND WATER AND VEGETATIONAL STRUCTURES, GROUND WATER COURSE COINCIDENCE METHOD AND VARIABILITY

DIAGRAM IN CONTEXT OF ECOLOGICAL INVESTIGATIONS ON VEGETATIONAL UNITS AFFECTED BY GROUND WATER, NOVA ACTA LEOPOLDINA, VOL. 38, NO. 6, (IN GERMAN),
For primary bibliographic entry see Field 2F.
W78-04599

4C. Effects On Water Of Man's Non-Water Activities

ACCIDENTAL AND PLANNED WEATHER MODIFICATION IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W78-04205

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1976,
Geological Survey, Anchorage, AL. Water Resources Div.
P. F. Doyle, and J. M. Childers.
Open-file report 77-170 (basic data), 1976. 77 p, 50 fig, 2 tab, 6 ref.

Descriptors: *Channel erosion, *Alaska, *Pipelines, *Oil, *Conveyance structures, Environmental effects, Floods, Rivers, Data collections, On-site investigations, Aerial photography, Evaluation, *Trans-Alaska pipeline river crossings.

Channel surveys were made along the TAPS (Trans-Alaska Pipeline System) route during 1976 at the same 27 sites that were surveyed in 1975. One additional site was put under surveillance in 1976. Except for construction changes wrought by installation of the pipeline, most of the sites surveyed showed very little change since the 1975 surveys. Some of the significant events of 1976 at the monitored crossing sites include: glacier-dammed lake break-out floods on the Tazlina and Tsina Rivers, severe icings on the Gulkana River which resulted in a spring flood 3-4 feet (1 meter) over banktop, and virtual completion of all the buried crossings and all but one overhead crossing before the 1976 channel erosion resurveys were made. Aerial photogrammetric surveys were used again in 1976 on the same seven sites as in 1975. Comparison of the photogrammetric surveys with each other and with on-the-ground surveys indicate that the method is generally applicable for channel erosion studies. However, it requires engineering judgement and personal knowledge of the site to avoid reaching inaccurate conclusions about channel change in some instances. (Woodard-USGS)
W78-04259

THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 2L.
W78-04536

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 3E.
W78-04657

4D. Watershed Protection

EFFECTS OF URBAN LAKES ON QUANTITY AND QUALITY OF BASEFLOW,
Wisconsin Univ.-Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W78-04206

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1976,
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-04259

HYDROLOGIC FACTORS AND ENVIRONMENTAL IMPACTS OF MASS SOIL MOVEMENTS IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
G. Ketcheson, and H. A. Froehlich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 710, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Research Institute, Oregon State University, Completion Report WRRI-56, January 1978. 94 p, 8 fig, 14 tab, 57 ref, 3 append. OWRT A-040-ORE(1).

Descriptors: Soil movement, Erosion, Avalanches, Watershed erosion, Landslides, *Oregon, Coasts.

Mass soil movements of four types; debris avalanche, debris torrent, debris slide and bank slough, were field inventoried in the Oregon Coast Range. A total of 104 mass movements were located in 21 undisturbed watersheds and 13 clearcuts harvested in the last six years. Failures associated with roads and landings were not included in this inventory. Failure volume ranged from 2 yd3 to 196 yd3. The average volume of all failure types ten cubic yards or more in volume is 41 yd3 in undisturbed watersheds and 47 yd3 in clearcuts. Failures less than ten cubic yards are of little significance in terms of initial volume moved, but in undisturbed watersheds they account for over one-fourth of the channel impact by mechanical scour and deposition. The frequency of all failures is similar in clearcuts and undisturbed watersheds, one in 19 acres and one in 17 acres, respectively. The results are compared with other studies in the Pacific Northwest and the differences are discussed. Natural variation accounts for much of the differences. Guidelines are given for assessing the risk of damage by debris avalanche and torrent type failures in proposed timber harvest areas. (Buckley-Ore St)
W78-04365

THE ROLE OF VORTICITY IN DEVELOPING LINEATION BY WIND EROSION,
Central Michigan Univ., Mount Pleasant.
For primary bibliographic entry see Field 2J.
W78-04517

DRAIN DISCHARGE FROM A LEVEL AGRICULTURAL WATERSHED,
Guelph Univ. (Ontario). School of Engineering.
T. C. Sharma, and R. W. Irwin.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 103, No IR4, Proceedings Paper 13399, p 429-443, December 1977. 7 fig, 3 tab, 12 ref.

Descriptors: *Drainage, *Agricultural watersheds, *Discharge(Water), Drainage patterns(Geologic), Hydraulic conductivity, Hydrography, Hydrology, Model studies, Surface runoff, Tile drainage, Watersheds(Basins), Subsurface drainage, Two parallel linear reservoir model.

A hypothesis was developed that watershed discharge from rainfall, for nonfreezing periods from a tile drained level watershed, was mainly tile flow with negligible amounts of surface runoff and base flow. Daily discharges at the watershed oulet were due to depletion of 2 parallel linear reservoirs. A fast reacting reservoir, represented by the physical shallow plowed layer, constituted nearly 40% of the total runoff volume. The slow reacting reservoir, represented by the subsoil zone, contributed nearly 60% of the total runoff volume. (Lee-ISWS)
W78-04522

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

RESERVOIR METALIMNION OXYGEN DEMANDS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
J. A. Gordon, and B. A. Skelton.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE6, Proceedings Paper 13437, p 1001-1011, December 1977. 10 fig, 1 tab, 14 ref, 2 append.

Descriptors: *Reservoirs, *Oxygen demand, *Water quality, Temperature, Thermocline, Density, Lakes, Bacteria, Algae, Dissolved oxygen, Phytoplankton, Zooplankton, Chlorophyll, Biochemical oxygen demand, On-site investigations, On-site data collections, Model studies, Mathematical models, Metalimnion.

Field data showed that oxygen demanding substances, both biotic and abiotic, are concentrated in the metalimnions of stratified lakes and reservoirs. The result is that high rates of oxygen depletion occur in the depth zone, and the dissolved oxygen is often depleted. Consideration of the settling dynamics of organic particles according to Stoke's Law showed that the changes in water density and viscosity with temperature result in reduced terminal settling velocities through the metalimnion. Thus, these particles are settling into the metalimnion faster than they are settling out, and higher concentrations are effected. The calculated changes in settling velocities were compared to changes in dissolved oxygen, chlorophyll a, phytoplankton, zooplankton, and BOD. These materials are concentrated in the metalimnions of lakes and reservoirs, and the result is loss of dissolved oxygen in this critical depth zone. (Sims-ISWS)
W78-04202

UTILITY OF A SCANNING DENSITOMETER IN ANALYZING REMOTELY SENSED IMAGERY,
National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.
For primary bibliographic entry see Field 7B.
W78-04220

CHEMICAL COMPOSITION OF SNOW ON THE WATER SURFACE OF THE KAMA AND VOTKINSK RESERVOIRS,
Perm State Univ. (USSR). Lab. of Water Management Research.
For primary bibliographic entry see Field 2C.
W78-04222

APPLICATION OF REMOTE SENSING IN THE DETERMINATION OF WATER QUALITY IN NEBRASKA RESERVOIRS,
Nebraska Univ., Lincoln. School of Life Sciences.
G. L. Hergenrader.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-30633, Price codes: A02 in paper copy, A01 in microfiche. NASA Contract Report 148776, July 22, 1976. 10 p, 5 tab.

Descriptors: *Pollutant identification, *Remote sensing, *Water quality, *Lakes, Satellites(Artificial), Turbidity, Suspended solids, Chlorophyll, Regression analysis, Correlation analysis, Data processing, On-site data collections, Trophic level, Eutrophication, *LANDSAT, *Lake McConaughy(Neb), Nebraska.

In June, July and August 1975, ground truth was collected from Lake McConaughy, a 35,000 acre reservoir in western Nebraska, coincident with the over-flights of LANDSAT. Water samples were collected on 6 different dates and were analyzed for turbidity, suspended solids, and chlorophyll. The objective of the research was to confirm earlier observations that reflectance data from LANDSAT CCT's correlate very well with certain water quality parameters, especially suspended solids, turbidity, and chlorophyll concentration. The additional data collected have resulted in even stronger correlations than were reported earlier. However, an unfortunate aspect is that the confidence intervals associated with the regression equations are extremely broad, suggesting that even though the parameters can be detected and measured by remote sensing, the accuracy of the measurements is questionable. The measurements were not precise enough to detect subtle changes in the trophic status of a lake or reservoir or to allow categorization of groups of lakes closely placed along the trophic spectrum. They can, however, be used with confidence to distinguish between and to classify lakes at the ends of the trophic spectrum from oligotrophic to eutrophic. (Sims-ISWS)
W78-04231

ANALYSES OF NATIVE WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED FROM THE ATCHAFALAYA RIVER AND ATCHAFALAYA BAY,
Geological Survey, Baton Rouge, LA. Water Resources Div.
C. R. Demas.
Open-file report 77-769, November 1977. 17 p, 1 plate, 5 tab, 12 ref.

Descriptors: *Channel improvement, *Water quality, *Pesticides, *Heavy metals, *Louisiana, Environmental effects, Baseline studies, Basic data collections, Chemical analysis, Water analysis, Core drilling, Sampling, Rivers, Channels, Bays, *Atchafalaya River(La), *Atchafalaya Bay, Pre-channel improvement study, Elutriate samples.

During October and November 1976 the U.S. Geological Survey, in cooperation with the U.S. Army Corps of Engineers, collected native water and core material from 14 sites along the Atchafalya River in Louisiana (from the head of Whiskey Bay Pilot Channel to American Pass) and 5 sites in Atchafalya Bay for evaluation of possible environmental effects of a proposed channel-enlargement project. Core material from all river sites and one bay site was collected to a depth of 50 feet (15 meters). At the remaining bay sites, samples were collected to a depth of less than 6 inches (15 centimeters) using a pipe dredge. Core material and native water were analyzed (separately and as elutriate samples prepared from mixtures) for selected metals, nutrients, organic compounds, and physical characteristics. No interpretation of the data is given. (Woodard-USGS)
W78-04245

GROUND-WATER RESOURCES OF THE RIVIERA BEACH AREA, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04247

SALINE-WATER INTRUSION IN THE FLORIDAN AQUIFER IN THE FERNANDINA BEACH AREA, NASSAU COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04248

GROUND-WATER BASIC DATA FOR MORTON COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04252

GROUND-WATER RESOURCES OF GRIGGS AND STEELE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04253

GROUND-WATER RESOURCES OF CAVALIER AND PEMBINA COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04254

WATER-QUALITY EFFECTS ON BAKER LAKE OF RECENT VOLCANIC ACTIVITY AT MOUNT BAKER, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-04260

SUBMARINE SEEPAGE OF NATURAL GAS IN NORTON SOUND, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab., and Geological Survey, Seattle, WA. Geology Div.
For primary bibliographic entry see Field 5B.
W78-04262

GEOLOGY AND WATER RESOURCES OF THE NORTHERN PART OF THE JUDITH BASIN, MONTANA,
Geological Survey, Billings, MT. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04263

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04266

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04267

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04268

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-04269

DETECTION OF TRINITROTOLUENE IN WATER BY FLUORESCENT ION-EXCHANGE RESINS,
Naval Weapons Center, China Lake, CA.
C. A. Heller, R. R. McBride, and M. A. Ronning.
Analytical Chemistry, Vol. 49, No. 14, p 2251-2253, December, 1977. 2 fig, 2 tab, 6 ref.

Descriptors: *Analytical techniques, *Ion exchange, *Water analysis, *Chemical wastes, *Pollutant identification, Industrial wastes, Effluents, Adsorption, Fluorescence, Resins, *Explosives, Effluents, Monitoring, Waste water treatment, *Trinitrotoluene.

A process for the detection of TNT (2,4,6-trinitrotoluene) in effluent water from ammunition plants is described. The process is based on the absorption of TNT on a quarternary ammonium ion-exchange resin which darkens in the presence of TNT. TNT can be detected at levels of 70 ppb and the presence of any colored species can be verified with the system. The analytical apparatus includes a liquid flow system and an optical system for illuminating and viewing the ion-exchange beads in the liquid system. An ultraviolet light source is used to irradiate the resin; fluorescence is measured by a photomultiplier, radiometer, and recorder. Interferences to the procedure include the presence of any colored anion, organic 'dye', or dark particulate matter. The method is suggested for use in a semicontinuous monitoring system. (Schulz-FIRL)
W78-04271

COMPOSITION OF EFFLUENTS FROM THE BLEACHING OF SPRUCE SULPHATE PULP (ZLOZENIE ODPADOVYCH VOD Z BIELENIA SMREKOVEJ SULFATOVEJ BUNICINY),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
T. Halmova, and L. Balhar.
Papir a Celuloza, Vol. 32, No. 5, p 12-15, 1977. 3 fig, 4 tab, 12 ref.

Descriptors: *Bleaching wastes, *Pulp and paper industry, *Biochemical oxygen demand, *Chemical oxygen demand, Pollutant identification, Chlorination, Effluents, Waste water treatment.

Laboratory experiments were conducted to examine bleaching of spruce sulphate pulps with different Kappa numbers with respect to variations in effluent characteristics. Concentrations of 5-day BOD, COD, and oxidizability were the parameters used in comparing the effluents. The analyses indicated that the Kappa number of the unbleached pulp and the amount of chlorine added during the chlorination contribute heavily to variations in effluent characteristics. Laboratory bleaching experiments are suggested for the prediction of pollutant loads from each of the various stages of the bleaching process, independently of the effects of washing between the single bleaching stages. (Schulz-FIRL)
W78-04280

EFFECT OF EFFLUENT COMPOSITION VARIABLES ON FLOCCULATION OF SUSPENDED SOLIDS IN LIME-SULFIDE UNHAIRING EFFLUENTS,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
For primary bibliographic entry see Field 5D.
W78-04285

ON THE WATER EXAMINATIONS OF THE RIVERS AT THE PIEDMONT DISTRICT OF MT. TOKACHI IN AND AROUND KAMIFURANO CHO, (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
For primary bibliographic entry see Field 5B.
W78-04313

METHOD AND APPARATUS FOR CONTINUOUSLY MONITORING THE PRESENCE OF OIL IN WATER,
Texaco Inc., New York.
R. M. Dille, M. H. Van Stavern, D. L. Shull, and D. Gripshover.
U.S. Patent No. 4,045,671, 5 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2318, August 30, 1977.

Descriptors: *Patents, *Pollutant identification, *Oil pollution, Water pollution sources, Monitoring, Measurement, *Infrared absorption measurement.

A sensitive arrangement for determining the presence of oil, at low parts per million, in water employs infrared absorbtion measurement. First the water is mixed with about 10% by volume of trichlorotrifluoroethane, an oil solvent that may be separated from the water after taking any oil into solution. The solvent is one which does not have any significant infrared absorbency at a predetermined wave length, which does have absorbency by hydrocarbons. After separation of th oil solvent, it is continuously passed through an absorption cell in an infrared spectrometer, to monitor the presence of oil in the water. (Sinha-OEIS)
W78-04322

FLOATING BAG FOR POLLUTION STUDY,
Case Existological Labs., Ltd., Victoria (British Columbia). (Assignee).
J. N. Case.
U.S. Patent No. 4,046,178, 5 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 129, September 6, 1977.

Descriptors: *Pollutant identification, *Patents, *Water pollution, *On-site investigations, Sampling, Floating, Water levels, Floating bags, Differential head.

A method for capturing a column of water in a flexible, floating bag is provided, where the water to be stored is the same as the body of water in which the bags are deployed. The bag is formed from a material that is relatively resistant to stretching. When it is deployed, for example in the ocean, there is maintained within the bag a water level slightly higher than the level of the water in the surrounding marine environment. The result is that the bag becomes turgid and resists distortion such as that caused by cross currents. In order to fill the bags with water from the surrounding marine environment, a collapsed bag provided with floats around its mouth is taken down, for example by a diver, to the point at which the mouth is below (40 feet or so) the surface of the water. The bag is then released. Due to the floats in the mouth, the bag instantly rises to the surface, expanding as it does so and becoming filled with water. When the bag reaches the surface, it will be substantially filled with water. It can then be attached to a suitable float and the differential head created by the pumping of a marginal amount of extra water to raise the level of the water within the bag to a level slightly above the level of the surrounding environment. (Sinha-OEIS)
W78-04323

MIXING LENGTH FOR REPRESENTATIVE WATER QUALITY SAMPLING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
T. G. Sanders, D. D. Adrian, and J. M. Joyce.
Journal Water Pollution Control Federation, Vol 49, No 9, p 2467-2478, December 1977. 3 fig, 4 tab, 24 ref. OWRT A-041-MASS(5).

Descriptors: *Diffusion, *Water quality, *Sampling, Channels, Monitoring, Turbulence, Hydrology, Mixing, Tracers, Equations, Instrumentation, *Pollutant identification, *Mixing length(Sampling).

A theoretical approach to determine zones of relatively complete mixing in a straight, uniform channel for representative water quality sampling was presented. The mixing length equation was based upon classical image theory and mean estimates of the lateral and vertical turbulent diffusion coeffiecents. The coefficients were estimated simultaneously in a procedure minimizing the squared deviations between field tracer concentrations and the concentrations predicted from the recently derived analytical solution to the three-dimensional, unsteady-state, advection and dispersion partial differential equation. The mixing lengths and the turbulent diffusion coefficients of the test stream compared favorably with results of other researchers. An easily assembled, inexpensive sampling device was tested and used to collect tracer samples at several depths simultaneously without disturbing the tracer mixing. (Lee-ISWS)
W78-04334

SURFACE WATER QUALITY IN CANADA - AN OVERVIEW.
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5G.
W78-04349

NITRILOTRIACETIC ACID (NTA) IN THE CANADIAN ENVIRONMENT,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5B.
W78-04350

WATER QUALITY SURVEYS ON THE NIAGARA RIVER - 1974,
Department of the Environment, Burlington (Ontario). Water Quality Div.
C. H. Chan.
Report Series No. 48, 1977. 9 p, 3 fig, 7 tab.

Descriptors: *Water quality, *Surveys, *Nutrients, *Pesticides, *Chemical properties, Heavy metals, Water pollution, Temperature, Statistics, Canada, *Niagara River, *Niagara-on-the-Lake.

Five water quality surveys were carried out from July to December of 1974 at Niagara-on-the-Lake to examine the cross-sectional, downstream and seasonal variation of the water chemistry of the mouth of the Niagara River. Sixteen surface water samples were collected for three consecutive days on each survey. The water samples were analyzed for nutrients, dissolved major ions, heavy metals and organic contaminants. Variance analysis of the results indicates that there is no lateral or cross-sectional variation in the water chemistry and that the variability in the water quality of the Niagara River is both parameter and season dependent. (WATDOC)
W78-04358

WATER QUALITY OF URBAN STORM WATER RUNOFF IN THE BOROUGH OF EAST YORK,
For primary bibliographic entry see Field 5B.
W78-04359

ANALYTICAL MONITORING FOR EFFLUENT POLLUTION,
British Ceramic Research Association, Stoke-on-Trent (England).
P. H. Brassington.
Transactions and Journal of the British Ceramic Society, Vol. 76, No. 5, p 13-14, 1977. 2 tab, 1 ref.

Descriptors: *Analytical techniques, *Monitoring, *Sampling, *Pollutant identification, Effluents, Hydrogen ion concentration, Suspended solids, Metals, Chemical oxygen demand, Biochemical oxygen demand, Industrial wastes.

Various methods of waste water sampling and pollutant identification available to the pottery industry are reviewed. Sampling of industrial waste waters should be conducted so as to provide information on the daily variation in effluent composition, as well as on the particular sources of waste water contaminants. The pH of the sample should be measured as soon as possible after collection. Suspended solids are normally measured by filtration of the effluent through a fine grade filter paper. Atomic absorption spectrophotometry is used to measure lead, cadmium, zinc, chromium, copper, nickel, and tin. The high clay content of pottery manufacturing waste water often makes it necessary to subject the effluents to acid digestion prior to metal analysis. Procedures for BOD and COD analyses are outlined. Typical limits for effluent discharge in the Stoke-on-Trent area in England are listed. (Schulz-FIRL)
W78-04376

ENVIRONMENTAL TRACE ANALYSIS OF ORGANICS IN WASTE WATER BY GLASS CAPILLARY COLUMN CHROMATOGRAPHY AND ANCILLARY TECHNIQUES,
Colorado Univ., Boulder. Dept. of Chemistry.
R. E. Sievers, R. M. Barkley, G. A. Eiceman, R. H. Shapiro, and H. F. Walton.
Journal of Chromatography, Vol. 142, p 745-754, 1977. 3 fig, 25 ref.

Descriptors: *Pollutant identification, *Gas chromatography, *Mass spectrometry, *Ozone, *Chlorination, *Organic compounds, Colorado, Treatment facilities, Industrial wastes, Waste water treatment, Waste water disposal.

Products formed during ozone treatment of secondary waste water were analyzed with gas chromatography and mass spectrometry techniques. The ozonization of waste water was tested as an alternative to disinfection by chlorination which has been shown to produce carcinogenic compounds that may enter potable water sources. Waste water samples were obtained from the Upper Thompson Sanitation District treatment facility in Estes Park, Colorado, where ozonization was being used. Chromatograms of the waste water after ozonization revealed the presence of n-hexanal, n-octane, n-heptanal, n-octanal, and n-nonanal. A chromatogram taken before ozonolysis indicated significant concentrations of chlorinatd hydrocarbons. After ozonization, quantities of chloroform and tetrachloroethylene were unchanged from levels recorded before ozone treatment. Halogenated hydrocarbon concentrations in ozone-treated effluent were found to be lower than levels in chlorinated waste water. Unknown hydrocarbons with carbon numbers ranging 9-11 remained relatively unchanged after ozonization. Caffeine was found to be a significant component of secondary treated effluent; caffeine derivatives were observed after ozonization under laboratory conditions. (Lisk-FIRL)
W78-04387

NEW HYGIENIC FLOWMETER.
For primary bibliographic entry see Field 7B.
W78-04392

TWO-STAGE ACTIVATED SLUDGE BETTER THAN SINGLE FOR TOXICITY REDUCTION.
For primary bibliographic entry see Field 5D.
W78-04406

FUNDAMENTAL PRINCIPLES OF SLUDGE ANALYSIS (GRUNDLAGEN DER ANALYTIK VON SCHLAEMMEN),
G. Jaekel.
Vom Wasser, Vol. 48, p 199-212, 1977. 6 tab.

Descriptors: *Analytical techniques, *Pollutant identification, *Industrial wastes, *Clarification, Sludge treatment, Water analysis, Waste water treatment.

The need for a uniform series of analytical techniques for industrial waste water sludges has been recognized with the creation of the 'German unified processes for the examination of water and sewage'. Various methods exist for the determination of physical and chemical properties of waste water sludges, including microorganisms content, dewaterability, pH, viscosity, specific resistance to filtration, and chemical constituents. Analytical techniques for industrial wastes are outlined, with special reference to sludge leachates. (Schulz-FIRL)
W78-04410

THE COORDINATED MEDITERRANEAN POLLUTION MONITORING AND RESEARCH PROGRAM,
United Nations Environment Program, Geneva (Switzerland).
For primary bibliographic entry see Field 5G.
W78-04412

QUALITY ASSURANCE PROGRAM FOR TRACE HYDROCARBON ANALYSIS,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
S. N. Chesler, H. S. Hertz, W. E. May, and S. A. Wise.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 1-14, March 1977. 3 tab. 01-6-022-11469.

Descriptors: *Pollutant identification, *Analytical techniques, *Baseline studies, *Water pollution, Alaska, Resources development, Sediments, *Outer Continental Shelf, Quality assurance, Hydrocarbons.

This program was undertaken to assess the analytical integrity of hydrocarbon analyses performed by NOAA laboratories and NOAA contractors. Since chemical data reported to NOAA originates from several different laboratories, it is imperative that these data be uniform in quality so that there is a basis for comparison of the data. Of the Alaskan sediment samples analyzed by the liquid chromatograph (LC) method, only Katalla River sediment showed presence of polynuclear aromatic hydrocarbons (PAH's). Since there is a low level, natural oil seep on the Katalla River, the presence of PAH's in the river sediment is to be expected. The other sediment collection stations must be considered to be frr from any detectable PAH contamination. The methodology for the analysis of hydrocarbon content in biological tissue samples has been completed and verified. The method will be used to determine the hydrocarbon baseline in Mytilus samples backlogged at NBS. The sediment intercalibration exercise results indicated that wide (factor of 50) variations can occur when different laboratories analyze the same low-level hydrocarbon samples. Detailed evaluation of the results indicates that the numbers are not in the same population, and therefore no statistical evaluation of the data (Other than reporting ranges) can be made. These observations confirm the need for a strong program in quality assurance. (Sinha - OEIS)
W78-04457

INTERLABORATORY COMPARISON OF ANALYSES FOR TRACE LEVEL PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
L. R. Hilpert, W. E. May, S. A. Wise, S. N. Chesler, and H. S. Hertz.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 15-39, March 1977. 6 tab, 16 ref.

Descriptors: *Water pollution, *Pollutant identification, *Analytical techniques, *Baseline studies, Alaska, Sediments, Oil pollution, Resources development, *Outer Continental Shelf, Petroleum hydrocarbons.

Results of analyses for petroleum hydrocarbons at the ppb level in marine sediments have been compared among eight laboratories. Values for concentrations of total extractable hydrocarbons scattered between 9 to 500 microgram/kg and 49 to 6625 microgram/kg for the two sites examined. Scatter of results for hydrocarbons in the gas chromatographic elution range, the most abundant aliphatic and aromatic hydrocarbons, and total polynuclear aromatic hydrocarbons (four rings and larger) were similar. Results for percent water and pristane/phytane ratio were somewhat more consistent. Sample inhomogeneity and analysis uncertainty contributed to an observed intralaboratory precision of plus or minus 25 percent for nine replicate analyses of one sediment sample. The data are discussed with regard to the reliability and comparability of current methods for environmental baseline measurements. (Sinha-OEIS)
W78-04458

RESEARCH AND EVALUATION OF TRACE ELEMENT METHODOLOGY FOR THE ANALYSIS OF SEA WATER,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
I. L. Barnes, H. M. Kingston, T. C. Rains, and J. R. Moody.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 38-88, March 1977. 5 tab, 30 ref, 2 append.

Descriptors: *Pollutant identification, *Water pollution, *Baseline studies, *Analytical techniques, Methodology, Trace elements, Sea water, Fresh water, Neutron activation analysis, X-ray fluorescence, Alaska, *Outer Continental Shelf, Atomic absorption spectrometry, Activation analysis.

It was determined that a number of plastic materials may be suitable for the collection and storage of samples of sea water. The analysis for a variety of elements may be done accurately on as little as 100 ml of water even in the extremely clean waters of Alaska using graphic furnace atomic absorption spectrometry, if extreme care is taken to prevent contamination during the preconcentration procedure. A new preconcentration procedure was developed which should substantially help in these analyses in that only minimal handling of the sample is required, only reagents for which ultra purification procedures are available are required and the procedure appears adaptable to field or shipboard use. The procedure removes elements (i.e. Na, K, Ca, and Mg) that are interferences in many analytical methods and thus makes possible the use of a variety of techniques such as atomic absorption (flame or flameless), neutron activation and x-ray fluorescence. (Sinha-OEIS)
W78-04459

DISTRIBUTION OF LIGHT HYDROCARBONS, C1-C4, IN THE NORTHEAST GULF OF ALASKA, LOWER COOK INLET, SOUTHEASTERN BERING SHELF, NORTON SOUND AND SOUTHEASTERN CHUKCHI SEA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04461

NATURAL DISTRIBUTION OF TRACE HEAVY METALS AND ENVIRONMENTAL BACKGROUND IN ALASKAN SHELF AND ESTUARINE AREAS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W78-04463

HYDROCARBONS: NATURAL DISTRIBUTION AND DYNAMICS ON THE ALASKAN OUTER CONTINENTAL SHELF,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W78-04464

TRACE METAL CONTENT OF BOTTOM SEDIMENT IN NORTHERN BERING SEA,
Geological Survey, Menlo Park, CA.
H. Nelson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 728-735, March 1977. 3 fig, 3 tab.

Descriptors: *Baseline studies, *Water pollution sources, Water pollution, *Data collections, Heavy metals, *Bottom sediments, Resources development, Alaska, Trace elements, *Outer Continental Shelf, Bering Sea, Trace metals.

All analyses have been completed and all data resides on data files in computer storage. All old and new bulk data sets are being integrated into one master set with latitude and longitude locations and environmental information. On the basis of statistical results, elements will be plotted onto maps contoured into the third dimension by computer graphics. An example of a computer listing of elements Fisher K statistics that have been completed on part of the bulk set is included as well as an example of a completed reoport on mercury for the Kuskokwim region. (Sinha - OEIS)
W78-04465

CHARACTERIZATION OF ORGANIC MATTER IN SEDIMENTS FROM GULF OF ALASKA, BERING AND BEAUFORT SEAS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5B.
W78-04467

FULVIC ACIDS, HUMIC ACIDS, AND KEROGENS FROM SEDIMENTS OF THE GULF OF ALASKA AND EASTERN BERING SEA,
California Univ., Los Angeles. Dept of Earth and Space Sciences.
K. E. Peters, and I. R. Kaplan.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 839-857, March 1977. 4 fig, 2 tab, 15 ref.

Descriptors: *Pollutant identification, *Baseline studies, *Organic matter, Water pollution, Sedi-

ments, Fulvic acid, Humic acid, Diagenesis, Resources development, Alaska, *Water pollution sources, *Outer Continental Shelf, Hydrocarbons, Kerogen, Gulf of Alaska, Bering Sea.

Surface samples of sediment from Gulf of Alaska and the eastern Bering Sea were analyzed by the Leco carbon technique for carbon as fulvic acid, humic acid, and kerogen. Preliminary data indicate a crude correlation between fulvic acid/humic acid ratios and proximity to shore which may be attributed to: (1) differing degrees of diagenesis, and/or (2) mixing of marine and terrestrial humic substances. Carbon isotope data support the contention that the relative proportions of marine and terrestrial organic matter influence the FA/HA ratio. (Sinha - OEIS)
W78-04468

RIVER BASIN WATER QUALITY SAMPLING,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
D. A. Verdi, C. C. Clarkson, and D. D. Adrian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 029, Price codes: A06 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Publication No 82, Termination Report, September 1976. 110 p, 21 fig, 12 tab, 12 ref, 6 append. OWRT A-083-MASS(1).

Descriptors: *Pollutant identification, Massachusetts, *Sampling, Rivers, On-site data collections, *Basic data collections, Biochemical oxygen demand, Water quality, Suspended load, *Merrimack River(Mass).

A sound water quality data base provides an important input to officials responsible for the development of river basin management plans. Developing a sound water quality data base requires the collection and analysis of many water quality samples over a long period of time. The research reported focuses on two aspects of river basin water quality sampling. The first aspect is a study of various means by which representative coverage of the river basin can be obtained. Representative coverage of the river basin involves allocating sampling stations to different reaches of the river. Several criteria are explored empirically for their practicality in allocating sampling stations to various reaches of the Connecticut River system. The criteria include uniform area coverage and weighting in terms of BOD loads. The second aspect of river basin sampling reported is a study of suspended sediment loads in the Merrimack River. The suspended sediment data are modeled by time series methods. (Lefferts-Mass)
W78-04491

MOBILITY OF HEAVY METAL HUMATES IN SOILS AND SURFACE WATERS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W78-04494

TOXIC METALS IN SURFACE WATERS FROM COAL ASH,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Envrontemental Studies.
D. S. Cherry, and R. K. Guthrie.
Water Resources Bulletin, Vol. 13, No. 6, p 1227-1236, December 1977. 3 fig, 2 tab, 22 ref. ERDA AT(38-1-824), S-1750, S-1818.

Descriptors: *Pollutants, *Trace elements, *Leachate, *Water pollution sources, *Water pollution, Analytical techniques, Public health, Chemical analysis, Water analysis, Water chemistry, Fossil fuels, Water quality, Heavy metals, Runoff, Leaching, Cadmium, Mercury, *Coal ash, Solid waste disposal sites, Benthic sediment, Coal ash pollution.

The concentrations of 10 toxic elements (titanium (Ti), manganese (Mn), copper (Cu), chromium (Cr), zinc (Zn), arsenic (As), selenium (Se), cobalt (Co), cadmium (Cd), and mercury (Hg)) were measured in the water, benthic sediment, plants, invertebrates, and vertebrates of an ash basin and its drainage system at a coal-fired power plant of the Savannah River Project, Aiken, South Carolina, over a period of two years. During 12 months of this period, the basin was filled, and little settling of ash occurred. In the remaining 12 months, dredging had been completed, adequate settling occurred, and most of the effluent turbidity was removed. All elements were more concentrated in sediment and biota than in water, and 5 (Mn, Cu, As, Zn, and Se) were biomagnified by at least one biotic component as compared to concentration in benthic sediment. Plants had high accumulations of Ti, Mn, As, and Hg; invertebrates had high accumulations of Co, Hg, Cu, Cr, Cd, and As; and vertebrates greatly biomagnified Se and Zn. The streamlined biotic community of the system accomplished major removal of Mn, Zn, As, Se, and Cd from the effluent. The magnitude of bioaccumulation of Ti, Mn, Zn, As, Se, Cd, and Hg was increased during the period of adequate settling the Basin. (Henley - ISWS)
W78-04502

PROBLEMS WITH THE USE OF ULTRAVIOLET ABSORPTION FOR MEASURING CARBON COMPOUNDS IN A RIVER SYSTEM,
Durham Univ. (England). Dept. of Botany.
C. R. C. Sheppard.
Water Research, Vol. 11, No. 11, p 979-982, 1977. 4 fig, 11 ref.

Descriptors: *Carbon, *Humic acids, *Organic compounds, *Absorption, *Water properties, Analytical techniques, Organic acids, Humus, Peat, Water pollution sources, Water quality, Water pollution, Instrumentation, Waste identification, Optical properties, Organic matter, Chemical properties, Organic wastes, *Ultra-violet absorption, Sewage components.

The method of ultra-violet (uv) absorption for measuring dissolved organic compounds was used to trace the fate of 2 groups of compounds in a river. The first was a group originating from the peatland catchment whose uv absorption was stable for at least one week. The second was a group which appeared only by a major town, which was attributed to sewage compounds, and whose absorption was short lived (less than 24 h). Interferences were found with the method in marine and estuarine system. The interferences appear to make the method of limited value. In interference is such that absorption is severely depressed in saline waters within the range 220-260 nm. The substance causing the interference can be concentrated using a nylon column, but the substance loses its effect with time. (Henley-ISWS)
W78-04513

UNUSUAL RESPONSE OF A CUPRIC ION ELECTRODE IN PRAIRIE LAKE WATERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 1, p 141-143, January 1978. 1 fig, 7 ref.

Descriptors: *Copper, *Ions, *Electrodes, *Water analysis, *Copper compounds, Algicides, Copper sulfate, Analytical techniques, Fish, Aquatic life, Fish toxins, Hardness(Water), Chemical analysis, Algae, Water pollution sources, Algae control, Fisheries, Ecology, *Prairie lake waters, *Specific ion electrode, Electrode response.

The Orion cupric ion electrode exhibited the theoretical (Nernstian) response of 29-30 mV per concentration decade in deionized water solutions, but in certain moderately alkaline amd moderately saline natural waters of the Canadian prairies (pH 7.8-8.6, specific conductance 950-6550 microsiemens/cm), the response to added cupric ion of over 100 micrograms Cu/L was twice as great. The electrode, nevertheless, was usable in natural waters provided that calibration was made with water from the same source. (Henley-ISWS)
W78-04527

THE DETERMINATION OF VANADIUM IN AQUEOUS SOLUTIONS, AIR AND BIOLOGICAL MATERIAL: 1. THE DETERMINATION OF VANADIUM IN AQUEOUS SOLUTIONS, (IN GERMAN),
Farbenfabriken Bayer A. G., Leverkusen (West Germany). Physiologisches Chemie Analytisches Lab.
W. Pilz, S. Komischke, and G. Prior.
Int J Environ Anal Chem. 1(1), p 47-61, 1971.

Descriptors: Aqueous solutions, Salicylhydroxamic-acid, Salicyl, *Vanadium, *Pollutant identification.

The method originally described by Bhaduri and Ray for the determination of vanadate with salicylhydroxamic acid was modified by the present authors as early as 1958. At that time it was impossible to achieve linearity between extinction and concentration, and this relationship was described with a logarithmic function. A new study of this problem resulted in the establishment of linearity between extinction and extinction and concentration (straight calibration curve). In addition, the extraction equilibrium for the dye extracted from an aqueous phase was investigated. Examination of the Lambert and Lambert-Beer laws, the stability of the dye toward ageing, relative error, dependence of extinction on the concentration of reagent, and interference of foreign ions were discussed. Experimental procedures, analytical data and a simple method for the synthesis of analytically pure salicylhydroxamic acid were presented.--Copyright 1973, Biological Abstracts, Inc.
W78-04540

MODEL DDO/MARK V DIGITAL DISSOLVED OXYGEN ANALYZER.
National Oceanographic Instrumentation Center, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 021, Price codes: A02 in paper copy, A01 in microfiche. Instrument Fact Sheet 76012, June 1976. 6 p, 5 fig.

Descriptors: Evaluation, *Instrumentation, *Dissolved oxygen analyzers, Temperature, Water properties, *Pollutant identification, Martek Instruments Model DDO/Mark V Digital Dissolved Oxygen Analyzer.

A description, manufacturer's performance specification, results of performance and environmental evaluation tests, and comments on the Model DDO/Mark V Digital Dissolved Oxygen Analyzer are presented. The analyzer, manufactured by Martex Instruments, Inc., is designed for simultaneous in situ measurement of dissolved oxygen and temperature. Dissolved oxygen is sensed by a gold-silver polarographic membrane type probe designed to be automatically temperature compensated. Temperature is sensed by a thermolinear array utilizing a PN-junction semiconductor device. The sensor outputs are developed as analog signals which are then digitized by automatic-zeroing, commandable dual-slope circuitry which converts at rates of 5 to 7 times/second with appropriate integration for each conversion cycle. Readout is on a 4-digit panel meter switchable for each parameter; the display can be read continuously, made to flash at a fixed rate to conserve power, or disabled entirely while operating in a recording mode. A front panel jack permits analog strip chart recording of all parameters simultaneously, and a BCD signal can be obtained from the

digital panel meter for printer readout for the switch-selected parameter. The analyzer can be operated from nickel-cadmium rechargeable batteries, alternating current mains, or external batteries. Analyzer tests showed calibration errors and nonrepeatability data. Cleaning and recharging of the sensor were necessary during the evaluation period, and the readout display unit had to be replaced due to temperature sensitivity. (Wares-IPA)
W78-04547

BECKMAN FIELDLAB DISSOLVED OXYGEN SYSTEM.
National Oceanographic Instrumentation Center, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 029, Price codes: A02 in paper copy, A01 in microfiche. Instrument Fact Sheet 76011, June 1976. 10 p, 7 fig, 1 ref.

Descriptors: Evaluation, *Instrumentation, *Dissolved oxygen analyzers, Temperature, Water properties, *Pollutant identification, Beckman Instruments Fieldlab Dissolved Oxygen System.

A description, manufacturer's performance specifications, results of performance and environmental evaluation tests, and comments on the Beckman Instruments Fieldlab Dissolved Oxygen System are presented. The system is a portable unit designed to measure dissolved oxygen and temperature in situ in fresh water and salt water. Dissolved oxygen is sensed with a platinum-silver polarographic membrane type probe. Three sensors are available: a glass unit for sterilized laboratory work and two rugged units for in situ or laboratory applications (one including rubber diaphragm for pressure compensation). Temperature is sensed by an optional separate thermistor type probe which is used to manually set a temperature compensation dial on the face of the readout unit. Dissolved oxygen and temperature data are displayed on an analog panel meter and through an analog recorder output jack for dissolved oxygen alone. The unit can be powered by either a rechargeable nickel-cadmium battery pack or by direct current mains. Accessories and fittings are available to facilitate the system's use for laboratory, flow-through, or pipeline applications. Tests of the system showed calibration errors and nonrepeatability data which were attributed to selection of sensitive experimental procedures. The manual temperature compensation operation was inconvenient and is likely to lead to error in readings. (Wares-IPA)
W78-04548

DISSOLVED OXYGEN ANALYZER MODEL 330.
National Oceanographic Instrumentation Center, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 030, Price codes: A02 in paper copy, A01 in microfiche. Instrument Fact Sheet 76010, June 1976. 6 p, 3 fig, 1 ref.

Descriptors: Evaluation, *Instrumentation, *Dissolved oxygen analyzers, Temperature, Water properties, *Pollutant identification, Rexnord Instrument Products Dissolved Oxygen Analyzer Model 330.

The description, manufacturer's performance specifications, results of performance and environmental tests, and comments on the Rexnord Instrument Products Dissolved Oxygen Analyzer Model 330 are presented. The system measures dissolved oxygen and temperature in situ in fresh water and salt water. The system evaluated was comprised of the analyzer, a Model 61 field probe, and a Model 18 stirrer assembly (optional). Dissolved oxygen is sensed with a platinum-lead polarographic membrane type probe that is designed to be automatically temperature compensated. Temperature is sensed by a thermistor. Data are provided in the form of a visual display on an analog panel meter and through an analog recorder output jack. The Model 330 is powered by carbon-zinc batteries, and an optional feature permits operation from standard alternating current mains. The stirrer is powered by batteries. Tests of the analyzer showed calibration errors and nonrepeatability data. The probe unit was replaced during the evaluation due to failure to operate properly at low temperatures, and some corrosion of metal parts was noted after salt water exposure. (Wares-IPA)
W78-04549

PUBLIC HEALTH ASPECTS OF LAND UTILIZATION OF WASTEWATER EFFLUENTS AND SLUDGES,
Johns Hopkins Univ., Baltimore, MD.
For primary bibliographic entry see Field 5E.
W78-04604

A SIMPLE SOIL PERCOLATION TEST DEVICE FOR FIELD ENVIRONMENTALISTS,
Summit County Dept. of Environmental Health, Frisco, CO.
W. H. Smith, and P. E. Stark.
Environmental Health, Vol 40, No 3, p 138-139, November-December, 1977. 6 fig, 3 ref.

Descriptors: *Soil moisture meters, *Percolation, *Environmental engineering, *Water quality, *Sewage disposal, Analytical techniques, Environmental sanitation, Soil water movement, Moisture content, Instrumentation, Cesspools, Waste water treatment.

A simple float meter has been designed to provide accurate, reliable and systematic soil percolation data for sewage disposal site evaluations. The device consists of a styrofoam float, aluminum float rod, PVC float housing tube, and plastic end cap. It allows technicians to run several tests simultaneously. The float meter yields uniform, precise and reproducible test results. The float is placed in a hole at the test site and marked with tape. After the hole is filled with water and the initial level marked, level markings are registered for three consecutive time intervals once the water level decrease becomes consistent. The device can be constructed for about $10. More than one float meter can be used to conduct several simultaneous tests. (Lisk-FIRL)
W78-04619

METHODS FOR MEASURING THE DEGREE OF STABILITY OF AEROBIC STABILIZED SLUDGES,
Norsk Inst. for Vannforskning, Blindern.
A. S. Eikum, and B. Paulsrud.
Water Research, Vol. 11, No. 9, 1977. 7 fig, 6 tab, 18 ref.

Descriptors: *Sludge treatment, *Aerobic treatment, *Odor, *Stabilization, *Nitrification, Oxygen, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Hydrogen ion concentration, Pollutant identification.

Various parameters which can be used to assess the degree of stability of aerobically processed raw sludges were identified and then used to devise a definition of fully stabilized sludge. Sludges were termed fully stabilized after 14 days of storage at 20C, providing the Odor Intensity Index did not exceed 11 at any time. Aerobically stabilized having a 'soil' odor was not considered objectionable. Insufficient sludge aeration and detention periods contributed to an increase in the odor intensity. As long as temperature effects were considered, oxygen uptake rates were also deemed suitable measurements of stability. Nitrate concentrations on aerobic stabilized sludge were also suggested as a measure of stabilization. Both oxygen uptake and nitrification were judged to be reliable parameters of stability for primary sludge, mixed-primary chemical sludge, and septic tank sludge. BOD and COD reductions, pH changes, volatile suspended solids contents, and lead acetate tests were not considered adequate parameters for measuring sludge stability. (Lisk-FIRL)
W78-04620

THE EFFECT OF TOXIC LOADS ON EFFLUENT PURIFICATION SYSTEMS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W78-04623

METHOD DEVELOPMENT AND MONITORING OF POLYNUCLEAR AROMATIC HYDROCARBONS IN SELECTED U.S. WATERS,
Syracuse Research Corp., NY.
J. Saxena, D. K. Basu, and J. Kozuchowski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 635, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/1-77-052, November 1977. 83 p, 21 fig, 23 tab, 55 ref, append. ICC614, R803977.

Descriptors: *Monitoring, *Organic compounds, Water quality, *Pollutant identification, Water supply, Water treatment, *Potable water, Sampling, *Analytical techniques, Chromatography, Public health, Methodology, *Polynuclear aromatic hydrocarbons, Polyurethane foam plugs, Raw water.

A method for concentration of trace quantities of six representatives of the polynuclear aromatic hydrocarbon (PAH) family (fluoranthene, benzo(k)flouranthene, benzo(j)flouranthene, benzo(a)pyrene, benzo(ghi)perylene, and indeno(1,1,3-cd)pyrene) has been developed and successfully applied to PAH monitoring in finished drinking waters and their raw water sources in 10 selected water supplies in the eastern United States. PAH is collected by passing water through polyurethane foam plugs. Water is heated to 62 plus or minus 2 degrees Centigrade prior to passage, and flow rate is maintained at approximately 250 ml/minute to obtain quantitative recoveries. The collection is followed by elution of foam plugs with organic solvent, purification by partitioning with solvents and column chromatography on Florisil, and analysis by two dimensional thin layer chromatography-fluorometry and gas liquid chromatography-flame ionization detection. Employing this method and a sample volume of 60 liters, PAH was detected in all the 10 water supplies sampled. Although the sum of the six representative PAH values in drinking waters was small (0.9 to 15 ppt), the values found for raw waters were as high as 600 ppt. It was not determined whether PAH was removed during treatment or transformed to another product and thus escaped detection. The health significance that the presence of these levels of PAH, in finished and raw waters, may have to man is not known. (Wares-IPA)
W78-04656

MOVEMENT OF MERCURY-203 IN PLANTS,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W78-04658

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON NITROSAMINES.
Environmental Protection Agency, Research Triangle Park, NC. Office of Research and Development.
For primary bibliographic entry see Field 5C.
W78-04659

FUSION METHOD FOR THE MEASUREMENT OF PLUTONIUM IN SOIL: SINGLE-LABORATORY EVALUATION OF INTERLABORATORY COLLABORATIVE TEST,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
P. B. Hahn, E. W. Bretthauer, P. B. Altringer, and N. F. Mathews.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 965, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/7-77-078, July 1977. 76 p, 1 fig, 16 tab, 22 ref, append. EHE 625C (ABJ).

Descriptors: *Measurement, *Soil contamination, Quality control, Evaluation, Methodology, *Pollutant identification, Soil analysis, Laboratory tests, *Plutonium, Quantitative analysis, Fusion, Fusion method.

The results of a single laboratory evaluation and an interlaboratory collaborative test of a method for measuring plutonium in soil are presented. The method (described in the appendix) employs potassium fluoride and potassium pyrosulfate fusions to compose a 10-gram sample, barium sulfate precipitations, solvent extraction and electrodeposition to isolate the plutonium, and alpha spectrometry to measure the plutonium. The single laboratory evaluation demonstrated that the overall within-laboratory precision of the method can approach the precision of nuclear counting statistics alone. The interlaboratory collaborative test showed the coefficient variation representing differences between laboratories to be approximately 10% for concentration levels exceeding one disintegration per minute per gram. Also discussed are several problem areas associated with environmental actinide analyses, including difficulties that may be anticipated in requiring monitoring laboratories to adopt a specific complex method of this type. Suggestions for improving agreement between laboratories include establishing criteria for analytical results rather than requiring specific methodology. (Wares-IPA)
W78-04660

RELATIONSHIPS AMONG POLLUTION INDICATOR BACTERIA ISOLATED FROM RAW WATER AND DISTRIBUTION SYSTEMS BY THE PRESENCE-ABSENCE (P-A) TEST,
Ontario Ministry of the Environment, Rexdale.
J. A. Clark, and L. T. Vlassoff.
Health Lab Sci. 10(3), p 163-172, 1973.

Descriptors: *Bacteria, Distribution, Fecal coliforms, Filters, Fluorescent, Indicators, Isolated, Pseudomonads, Tests, Water samples, *Bioindicators, *Membrane filters, *Pollutant identification, *Potable water, Water supply.

Comparative analyses of raw and drinking water samples were made using membrane filter (MF) and presence-absence (P-A) precedures. Analysis of raw water samples were more suited to MF procedures, whereas analysis of drinking water samples was more effectively performed by the P-A procedure. Pollution levels in the samples influenced the types, frequencies and combinations of pollution indicator bacteria detected by the P-A test. Bacteria indicative of fecal pollution were the first to disappear following water treatment, although coliform bacteria were the principal organisms isolated from insufficiently treated water. Water considered potable from a sanitary aspect may still have an appreciable incidence of other bacteria present such as fluorescent pseudomonads.--Copyright 1974, Biological Abstracts, Inc.
W78-04664

INVESTIGATIONS OF THE IMPACT OF MERCURY ON ENCLOSED WATER COLUMNS USING A ZOOPLANKTON SIMULATION MODEL,
British Columbia Univ., Vancouver. Inst. of Oceanography.
N. C. Sonntag, and W. Greve.
Journal the Fisheries Research Board of Canada, Vol. 34, 1977, p 2295-2307, 12 fig, 4 tab, 21 ref.

Descriptors: *Pollutant identification, Environmental effects, *Water pollution sources, *Model studies, Plankton, Populations, *Zooplankton, *Mercury, Simulation analysis.

The population dynamics of three Controlled Experimental Ecosystems (CEEs) bags were monitored for 70 days. On day 8 one bag was polluted with 1 microg/l mercury and one bag with 5 microg/l mercury while the third bag was used as a control. A computer simulation model of a phytoplankton-zooplankton-salmon system was used to study causes of different Pseudocalanus minutus s.l. population dynamics in the bags. Use of the model demonstrated that it was not necessary to hypothesize a long-term effect of mercury on Pseudocalanus to explain the low population observed in the CEE to which 5 microg/l mercury was added but that it is possible that the direct impact of the mercury perturbation was to affect the physiology of Pseudocalanus causing a decrease in grazing pressure over the first 30 days. Indirect impact was the emergence of other dominant phytoplankton species, giving a negative feedback impact on Pseudocalanus by not providing food suitable for its nauplii. (Chilton-ORNL)
W78-04665

AQUEOUS RELEASE OF HEAVY METALS FROM TWO SEWAGE SLUDGES,
Agricultural Research Service, Morgantown, WV. Plant Sciences Div.
For primary bibliographic entry see Field 5B.
W78-04677

THERMOCOUPLE READOUT INSTRUMENT,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 7B.
W78-04678

EVALUATION OF 'CAM-1', A WARNING DEVICE FOR ORGANOPHOSPHATE HAZARDOUS MATERIAL SPILLS,
Midwest Research Inst., Kansas City, MO.
L. H. Goodson, and W. B. Jacobs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 647, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-219, MRI 3820-B Final Rept. Task I, November 1977. 43 p, 5 fig, 7 tab, 8 ref, 2 append. 1BB610, Proj. No.00202, EPA 68-03-0299.

Descriptors: *Pollutant identification, *Warning systems, *Monitoring, *Water pollution, Evaluation, Toxicity, Pesticide residues, Electrochemistry, Organic compounds, Enzymes, Insect control, *Organophosphates, *Cholinesterase Antagonist Monitor(CAM-1).

The Cholinesterase Antagonist Monitor (CAM-1) uses immobilized cholinesterase on a pororus polyurethane pad in an electro-chemical cell to sense the presence of low concentrations of cholinesterase inhibitors in water on a real time basis. The sensitivity of CAM-1 to organophosphates and carbamates is a function of the affinity of cholinesterase for them; thus its respone is greater for those compounds which are more toxic, i.e., the detectable concentrations are inversely proportional to the lethal dosages of these pesticides. Studies were conducted to show the sensitivity of the monitor to 22 organophosphates and 7 carbamate pesticides. Correlation of the sensitivity to chemical structure of the organophosphates shows that introduction of one or two sulfur atoms into the pesticide molecules reduces the sensitivity of the instrument for it. CAM-1 was suitable for monitoring of water for the presence of nonreversible invitro cholinesterase inhibiors. Applications are suggested for assessing the quality of water supplies and of plant effluents that may be contaminated by spills or chronic discharges of cholinesterase inhibitors. The appendices described CAM-1 and the mechanism of its electrochemical detection process. (Wares-IPA)
W78-04679

AERIAL AIR POLLUTION SENSING TECHNIQUES,
Environmental Protection Agency, Las Vegas, NV. Monitoring Operations Lab.
R. B. Evans.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Sect. I, p. 32-38. 1 tab.

Descriptors: *Air pollution, *Monitoring, California, Ozone, Smog, Nitrogen compounds, Aircraft, Methodology, Pollutants, Data collections, Pollutant identification, *Los Angeles Reactive Pollutant Program(LARPP), Atmospheric inversions.

The National Environmental Research Center at Las Vegas (NERC-Las Vegas) has developed techniques for aerial monitoring of air pollution for the Los Angeles Reactive Pollutant Program (LARPP). LARPP's purpose is to compile a data base for developing and validating mathematical air pollution photochemistry models. The program is concerned with photochemical reactions within a parcel of air as it moves downward. Both airborne and ground sampling platforms are used to isolate and follow air parcels in order to measure pollutant concentrations (NO, NO2, CO, O3, nonmethane hydrocarbons, and particulates.) Aircraft are also measuring temperature, dew point, and fluorescent particle concentrations, while ground stations are monitoring ultraviolet radiation. Air parcels to be sampled are identified with clusters at altitudes from 200 ft to the base of the inversion. Helicopters were chosen over dirigibles for greater maneuverability and load capacity. The rental rate for the Bell 212 helicopters currently in use is $20,000/mo plus $200/hr, including fuel and pilot. Data inputs are recorded directly into a digital data acquisition system is standard BCD code on magnetic tape. (Lynch-Wisconsin).
W78-04680

REMOTE DETECTION OF WATER POLLUTION WITH MOCS: AN IMAGINING MULTISPECTRAL SCANNER,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
G. W. Grew.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section II, p. 17-39, 14 fig, 1 tab, 4 ref.

Descriptors: *Remote sensing, *Pollutant identification, Water pollution, Instrumentation, Algae, Sediments, California, New York, North Carolina, Aircraft, Monitoring, Oceanography, Path of pollutants, *MOCS, *Multichannel Ocean Color Sensor, *Spectroradiometers, Multispectral scanners, Clear Lake(CA), New York Bight(NY), Cape Hattaras(NC).

Multichannel Ocean Color Sensor (MOCS), a multispectral scanner, is being used by the NASA Langley Research Center in developing a system for remote sensing of pollutant distribution in oceans and inland waters. Spacecraft and aircraft will be used to produce periodic maps of such pollutants as algae and sediment. Color spectral signatures emitted from a water mass can vary continuously, as with sediment. Sometimes, however, indicative patterns can be established readily when one pollutant is present. An algal bloom, for instance, can be easily identified as it is highly concentrated at the water surface and has a unique

spectral signature. When mixtures of pollutants occur, identification is more difficult. The MOCS, weighing only 23 lbs, is a visible-imaging spectroradiometer which scans electronically. It measures the intensity in 20 spectral bands at each of 150 spatial sites of the ocean across the field of view. Output of MOCS is fed to an A/D converter and stored on magnetic tape. An algal bloom in Clear Lake, CA, was mapped from data gathered on a flight at 37,400 ft (28 June 1972). Not only was the distribution of the algae mapped, but the type (Aphanizomenon) could be identified using the remote sensor. Flights over New York Bight and off Cape Hattaras (NC) provided data on the spectral signatures of acid wastes and the transition between two water masses. (Lynch-Wisconsin).
W78-04681

THE USE OF NEAR-INFRARED REFLECTED SUNLIGHT FOR BIODEGRADABLE POLLUTION MONITORING,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
W. E. Bressette, and D. E. Lear, Jr.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section II, p 69-89. 8 fig, 3 tab, 10 ref.

Descriptors: *Remote sensing, *Chlorophyll, *Infrared radiation, *Aerial photography, *Algae, Phytoplankton, Water pollution, Potomac River, *Monitoring, Nutrients, Pollutant identification, *Near-infrared photography(NIR).

Near-infrared (NIR) photographs of the Potomac River Salt Wedge Area were taken on October 2, 1972 from an altitude of 3 km to detect algal phytoplankton containing chlorophyll-a. Objectives of the program were to determine if the spatial and temporal changes of the chlorophyll could be measured remotely, and to determine if such measurements could index the stress of biodegradable pollutants on the ecosystem. Photographic film was used in the project, although an electronic readout sensor could be used in the future. Massive blooms of blue-green algae (Anacystis cyanea) occur as a result of sanitation plant nutrient deposition at the salt-freshwater interface. Photographic results were correlated with ground truth data. It was found that overdeveloping transparencies and prints from overexposed negatives through an NIR filter greatly enhances the contrast between the blooms and the water background. Bottom features as deep as 2 m can be photographed using an 89B Wratten NIR filter. The threshold for algal blooms with an NIR camera system is between chlorophyll-a concentrations of 34 and 51 micrograms/l. Detection of upwelling light in the NIR coupled with detection near 523 nm has a potential for measuring suspended sediment when chlorophlyy-a concentrations are below 34 micrograms/l. (Lynch-Wisconsin)
W78-04682

ST. LOUIS REGIONAL AIR MONITORING SYSTEM,
National Environmental Research Center, Las Vegas, NV.
J. A. Reagan.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section III, 1-16. 3 fig, 2 ref.

Descriptors: *Air pollution, *Monitoring, Missouri, Simulation analysis, Atmospheric physics, Fallout, Pollutant identification, *St. Louis(MO), Regional Air Monitoring System(RAMS), Regional Air Pollution Study(RAPS).

The Regional Air Pollution Study (RAPS) of St. Louis, MO, was created to develop mathematical simulation models of atmospheric processes affecting the transport and concentration of air pollutants. As a related research tool (but not as an enforcement monitoring network), the Regional Air Monitoring System (RAMS) was devised. RAMS will consist of 25 stations to monitor the following parameters: sulfur dioxide, hydrogen sulfide, total sulfur, carbon monoxide, total hydrocarbons, methane, nitrogen dioxide, nitric oxide, ozone, visibility, wind speed, wind direction, temperature, relative humidity, pressure, solar radiation, and particulate loading. The system is designed to obtain 90% data capture. Stations will be arranged in four concentric circles at 4, 9, 20, and 40 km from a central station near the Gateway Arch. The four outer stations will monitor background levels. Each station will be a 10 x 16-ft shelter mounted on concrete piers, with a 10 or 30-m tower on the north side. Stations are linked to a data center via telephone. The central facility includes a PDP-11/40 computer with 32 K core, three tape drives, three 1.2 megaword dishes, console, line printer, card reader, graphics printer/plotter, and CRT. A PDP-11/05 front-end processor handles station telecommunications. (Lynch-Wisconsin)
W78-04683

LONG PATH OPTICAL MEASUREMENT OF ATMOSPHERIC POLLUTANTS,
Health Effects Research Lab., Research Triangle Park, NC. Chemistry and Physics Lab.
A. E. O'Keeffe.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section III, p 17-21.

Descriptors: *Remote sensing, *Air pollution, Monitoring, Pollutant identification, Instrumentation, Research and development, *Lasers, *Gas lasers, Carbon dioxide lasers, Long path optical.

Air Quality Measurements Branch of the Chemistry and Physics Laboratory, National Environmental Research Center, Research Triangle Park, North Carolina, currently has three contracts for long path optical measurement. The underlying principle is that monochromatic light having a wavelength corresponding to a principal absorbance maximum of the pollutant is projected outwardly from a source to a retro-reflector, which returns the beam to its origin. There sensitive detectors read the intensities of the transmitted and received beams, and electronic logic devices compare the two intensity values and display a signal representing the light attenuation of the selected wavelengths as the beam traversed the path source-reflector-detector. In essence, the pollutant concentration is measured, although generally extraneous effects must be subtracted to measure only the pollutant. Wavelength-independent interferences can be eliminated by reading the difference in attenuation between two wavelengths, one being at a peak and the other at a valley, in the absorbance spectrum of the pollutant. This works well for turbulence, but less well for other absorbing gases. The contract with General Electric is for application of gas lasers (particularly the CO2 laser) to long path instrumentation. A contract with Lincoln Laboratories is similar, but uses a tiny crystal diode laser as the light source. The third contract, with Tulane University, involves applying more sophisticated tuning techniques to the CO2 laser. (Lynch-Wisconsin)
W78-04684

A REVIEW OF AVAILABLE TECHNIQUES FOR COUPLING CONTINUOUS GASEOUS POLLUTANT MONITORS TO EMISSION SOURCES,
Health Effects Research Lab., Research Triangle Park, NC. Chemistry and Physics Lab.
J. B. Homolya.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section III, p 22-49. 10 fig, 7 ref.

Descriptors: *Air pollution, *Gases, *Monitoring, Pollutant identification, Instrumentation, On-site data collections, Extractive monitoring, Ambient air monitoring sensors.

Nearly all present-day ambient air monitoring sensors have the required sensitivity, freedom from interferences, and adequate response time where application for source-level pollution monitoring presents no problem on the detectors themselves. But monitoring stationary sources of gaseous emissions, consideration must be given to the complete monitoring system. Stack emissions usually contain corrosive gases at elevated temperatures, and may have a high dew point temperature or include particulate matter of varying composition and size. The monitoring system must be capable of continuously extracting a sample from these types of sources, transporting it to the detector, and conditioning it, if necessary, for an accurate analysis. These processes must be consistent with the analytical method involved. There are several approaches to monitoring a gaseous source emission stream; the extractive ones involve sample conditioning techniques, including filtered probes, heated sample lines, water vapor removal systems, or a variety of dilution devices coupled to ambient air monitors. With dilution devices, it is possible for both ambient air and source monitoring to be accomplished by the same instrument. A recent investigation has demonstrated the viability of in-situ monitoring for SO2 which, in effect, eliminates all sample conditioning. In-stack monitoring avoids any extraction of sample by utilizing the sample stream itself as an analysis chamber. (Lynch-Wisconsin)
W78-04685

INSITU SENSOR SYSTEMS FOR WATER QUALITY MEASUREMENT,
Michigan Univ., Ann Arbor. School of Public Health.
K. H. Mancy.
In: Proceedings of Conference of Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section IV, p 1-26. 20 ref, 2 append.

Descriptors: *On-site data collections, *Monitoring, *Water quality, Remote sensing, Water pollution, Instrumentation, Pollutant identification, *Sensors, *Electrochemical sensors, Conductometric sensors, Potentiometric sensors, Voltammetric sensors, Ion-selective electrodes, Ion-specific electrodes.

Direct placement of sensors in the environment offers an ideal approach for water quality monitoring, but such sensor systems are available for only a few parameters. In addition, water flow, temperature, and chemical and biological interferences may affect sensor response. Sensor reliability depends on sensitivity, response time, selectivity, long-term stability, accuracy, and precision. In-situ electrochemical sensor systems currently available include conductometric, potentiometric, and voltammetric electrode systems. Potentiometric systems (specific ion or selective ion electrodes) include glass electrodes for pH measurement, inert metal electrodes (platinum or gold) for measuring oxidation-reduction potentials, and potentiometric membrane electrodes. Oxidation-reduction potential measurements can give meaningful results only under anaerobic conditions and in certain industrial waste effluents. Recently developed specific-ion electrodes can help monitor a variety of anions and cations. Solid-state specific-ion electrodes are more applicable for water quality monitoring than liquid ion exchange electrodes. Voltammetric membrane

electrodes are at present the only in-situ sensors capable of dissolved oxygen analysis; their unique feature is the separation of the electrode from the test solution by the membrane. (Lynch-Wisconsin)
W78-04686

A REGIONAL WATER QUALITY MONITORING SYSTEM,
Minneapolis Metropolitan Sewer Board of the Twin Cities Area, Md.
R. H. Susag.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section IV, p 38-57. 7 fig.

Descriptors: *Water quality, *Water quality control, *Monitoring, Minnesota, Sewage treatment, Water pollution, Water pollution control, Waste water treatment, Mississippi River, Automatic control, *Minneapolis(MN), *St Paul(MN), *Metropolitan Sewer Board(Minneapolis-St Paul MN), Twin Cities(MN).

The Metropolitan Sewer Board of the Twin Cities Area (MSB) is a seven-county regional agency created in 1969 by the Minnesota state legislature to preserve water quality, protect public health, and treat and dispose of sewage. MSB operates 24 wastewater treatment plants (consolidated from 33 when board began operation in 1970) for 90 communities comprising 85% of the population of the Minneapolis-St. Paul metropolitan area. A sampling program on the Mississippi River begun in 1926 is still in operation, with the addition of several monitors. Temperature, pH, turbidity, DO, BOD, coliform organisms, conductivity, chloride, and oxidation-reduction potential are monitored. Since 1965 this surveillance has also become an enforcement tool. The Minnesota Pollution Control Agency requires operation of all primary and secondary treatment plant units at maximum capability; tertiary treatment units are allowed variable operation, depending on water quality standards compliance. Considerations for siting of automatic water quality monitors include accessibility, availability of utilities, security, and representativeness of sample. The Board has entered into a cooperative program with the U.S. Geological Survey to develop a water quantity-quality monitoring network. The USGS maintains four gauging stations on the three major rivers in the area, and water quality monitors are being placed at three of the four sites, as well as at six other locations. (Lynch-Wisconsin)
W78-04687

WATER QUALITY MONITORING IN SOME EASTERN EUROPEAN COUNTRIES,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental and Water Resources Engineering.
P. A. Krenkel, and V. Novotny.
In: Proceedings of Conference of Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section IV, p 58-84. 28 fig, 4 ref.

Descriptors: *Water quality, *Monitoring, *Automatic control, Europe, River basins, Instrumentation, Pollutant identification, *Poland, *Odra River(Poland), Czechoslovakia, Hungary, Vistula River(Poland).

The United States has been the world leader in automatic water quality monitoring, with 205 stations in operation or under construction. Other countries have regarded the U.S.'s ORSANCO system as a model in developing their own systems. The World Health Organization (WHO) provides support through its United Nations Development Program (Special Fund endeavors); eastern European countries receiving support include Poland, Czechoslovakia, Romania, and Hungary. Poland, with six years of support, has built seven automatic monitoring stations, with 53 more in planning. Stations are currently located in the Odra and Wisla (Vistula) River basins. They are equipped with Honeywell W-20 monitors, capable of measuring temperatures from -5 to 40C, conductivity from 100-1000 mhos, DO from 0-15 ppm, pH from 1-14, oxidation-reduction potential in the + or - 500 mv range, turbidity from 0-500 ppm, chlorides from 1-1000 ppm, water level, and solar radiation. Water is delivered via a screw-type pump. Maintaining intake velocity at the same rate as river velocity proved to be the major problem. Periodical inquiry and teletype recording was the registering option selected. In Czechoslovakia three monitoring stations were installed in 1966, and five stations in Hungary are projected with WHO support. (Lynch-Wisconsin)
W78-04688

AN AIRBORNE LASER FLUOROSENSOR FOR THE DETECTION OF OIL ON WATER,
National Aeronautics and Space Administration, Wallops Island, VA. Wallops Station.
H. H. Kim, and G. D. Hickman.
In: Proceedings of Conference of Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section IV, p 85-95. 4 fig, 6 ref.

Descriptors: *Oil spills, *Remote sensing, Pollutant identification, Water pollution, Aircraft, Fluorescence, Virginia, Delaware River, Instrumentation, *Lasers, *Fluorosensors.

An airborne laser fluorosensor system to detect and map surface oil (from either spills or natural seepage) in large bodies of water is described. The system consists of a pulsed nitrogen laser, an f/l 28 cm diameter Cassegranian telescope, and a high-gain photomultiplier tube (RCA 8575) filtered by a UV blocking filter (0.01 and 0.3% transmission at 337 and 390 nm). The laser produces a nominal 1 m joule pulse of 10 nsec duration at 337 nm contained in a rectangular beam having a half-angle divergence of about 30 by 2 mradians. The repetition rate of 100 pulses/sec affords good spatial resolution when operated from an aircraft flying at 300 km/hr. Test flights off Norfolk, VA (May 1973) and on the Delaware River (August 1973) indicated that sensitivity of the instrument exceeds that of conventional passive remote sensors currently available. In the tests laser-induced fluorescence of the oil in the 450-500 nm spectral region was monitored. Each return pulse was fed into a range-gated multimode analog-to-digital (ADC) conversion unit which recorded the peak fluorescence amplitude. Images from aerial photography showed the presence of oil when a reading of 50 or greater was reached on the ADC output, showing much greater sensitivity of the laser fluorosensor in detecting oil traces. (Lynch-Wisconsin)
W78-04689

REMOTE SENSING DATA, A BASIS FOR MONITORING SYSTEMS DESIGN,
Geological Survey, Iowa City, IA.
J. V. Taranik, and S. J. Tuthill.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section V, p 17-31. 3 fig, 12 ref.

Descriptors: *Remote sensing, *Mississippi River, *Thermal pollution, Monitoring, Iowa, Illinois, Mapping, Floods, Flood plains, Nuclear powerplants, Powerplants, Water temperature, Pollutant identification, Thermal mapping, Nishnabotna River(IA).

To assess possible thermal pollution danger from a proposed diffuser pipe in the Mississippi River near Cordova, IL in connection with a nuclear power plant, the Iowa Geological Survey conducted a thermal mapping mission on 4 June 1971 from Keokuk (IA) to Clinton (IL) using a multispectral camera and uncalibrated infrared scanner mounted in a Twin Beechcraft. Thermal data was recorded directly on film by means of the 4.5-5.5 micron portion of the infrared spectrum. Corrobarating temperature data was collected at 13 ground stations. Thermal outfalls on the images were traced to their sources. Data showed that in June rivers flowing into the Mississippi were several degrees warmer than the main channel, and thermal outfalls from the Muscatine and Riverside electric power plants were over 10F hotter than the channel. Plumes extended over 1/4 mi downstream. Slough areas were particularly hot. The major result of the mission was the discovery that current-distribution patterns could be mapped very accuractely using thermal data. Slow-moving water appears warmer because the sun-heated surface is not mixed with underlying colder water. Such low-altitude flight over the Mississippi between Keobuk and the Iowa-Minnesota border was made to photograph all ice-free areas, in order to identify warm effluents. An aerial photographic flood-mapping mission was flown in September 1972 on the Nishnabotna flood plain. (Lynch-Wisconsin)
W78-04690

TECHNIQUES AND PROCEDURES FOR QUANTITATIVE WATER SURFACE TEMPERATURE SURVEYS USING AIRBORNE SENSORS,
National Aeronautics and Space Administration, Bay Saint Louis, MS. Earth Resources Lab.
L. E. Tilton, III, and K. R. Daughtrey.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section V, p. 32-58. 5 fig, 7 ref.

Descriptors: *Remote sensing, *Water temperature, *Thermal radiation, Aircraft, Methodology, Instrumentation, Data processing, Monitoring, Pollutant identification, Radiometers, Thermal scanners, Sensors.

NASA Johnson Space Center's Earth Resources Laboratory at the Mississippi Test Facility conducted remote sensing experiments using a Texas instruments RS-18 thermal scanning radiometer mounted in a light aircraft. A synopsis of thermal remote sensing techniques based on these tests is given. Major equipment needed includes: thermal scanning radiometer, calibration sources, scanner platfiorm (air craft or satellite) and data recording system, tapedeck and oscillograph, tape-to-film converter, photo processing facility, analog-to-digital converter (SDS930 computer), data processor (UNIVAC 1108 computer), SC4020 plotter for display proparation. Cloud cover and land/water differentiation should be considered in the choice of flight times, as clouds below the aircraft screen out thermal radiation, and at certain times of the day and night surface radiometric temperatures of land and water approach each other and may be indistinguishable in the imagery. Information is given on data acquisition procedures, including flight plan, system calibration, navigation, camera and thermal scanner operation, flight logs, voice annotation of tapes, and surface measurements. Data processing involves quick-look verification, qualitative analog data production, and quantitative digital data production. Finally, accuracy assessment, personnel, scheduling, and cost are discussed. (Lynch-Wisconsin)
W78-04691

REMOTE SENSOR IMAGERY ANALYSIS FOR ENVIRONMENTAL IMPACT ASSESSMENT,
Army Engineer Topographic Labs., Fort Belvoir, VA. Geographic Sciences Lab.
C. P. Weatherspoon, J. N. Rinker, R. E. Frost, and T. E. Eastler.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada

on October 10-11, 1973. Published December 1973, Section V, p 59-72. 2 fig.

Descriptors: *Environmental effects, *Methodology, *Aerial photography, Remote sensing, *Pollutant identification, Path of pollutants, Research priorities.

A conceptual framework is examined in which remote sensing data collected and analyzed by an interdisciplinary research team is focused on problems of concern to the Environmental Protection Agency. Most remote sensing interpretation procedures can be classified either as direct detection of discrete objects, or analysis of various environmental components. The latter are necessary for long-term planning. In most cases standard panchromatic aerial photography--much of it already available--provides the information required for basic environmental analysis. Regardless of the imagery type used, the study should start with an analysis of the smallest scale available (e.g., ERTS images). Next individual photographs at a scale of 1:15,000 to 1:20,000 are pieced into a mosaic. Finally a detailed study should be made of each set of stero pairs. Auxiliary data should be used where appropriate. An outline guide for analysis of natural features using aerial phots is given. The data gathered by remote sensing can be applied to such problems as pollution source location and characterization, impact assessment, controls and monitoring, projection of trends and potential problem areas, preventive measures, and research needs. (Lynch-Wisconsin)
W78-04692

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUBOPTIMUM WEATHER,
Earth Satellite Corp., Washington, DC.
P. M. Maughan, R. I. Welch, and A. D. Marmelstein.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section V, p. 73-86. 3 fig, 1 ref. EPA 68-01-1091.

Descriptors: *Oil spills, *Aerial photography, *Films, Monitoring, Weather, Pollutants identification, Water pollution control, Hazardous material spills.

Recommendations are given for use of aerial photography for prevention of detection of spills of oil or other hazardous materials under relatively poor weather conditions (unclear skies, or where horizontal visibility is less than 15 mi). Photography was tested under various combinations of cloud cover (scattered clouds to overcast) vs cloud base (1,000 to > 20,000 fit), and haze (< 2 to 4 mi visibility) vs sun angle (20 to 60 degrees above the horizon). Only positive color film (specifically Kodak SO-397 aerial color film) exposed through a Wratten iA filter provided adequate image quality under all conditions tested. This film can, in fact, be used under any daylight conditions in which an aerial photographic missin can be flown in safety. Color infrared and black-and-white panchromatic films are not recommended for these weather conditions. It should be noted that as aircraft altitude decreases due to low cloud ceilning, image motion increases unless airspeed is decreased as well. A single-engine, high-wing monoplane is preferred for suboptimal weather conditions. A scale of 1:5,000 provides adequate detail with a high-quality camera system. (Lynch-Wisconsin)
W78-04693

ENVIRONMENTAL APPLICATION OF THE EARTH RESOURCES TECHNOLOGY SATELLITE,
General Electric Co., Beltsville, MD. Space Div.
D. T. Schultz, and C. C. Schnetzler.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section VII, p. 11-26. 10 fig, 7 ref.

Descriptors: *Remote sensing, *Satellites, *Aerial photography, *Monitoring, Mapping, Water pollution, Planning, New Jersey, Chesapeake Bay, Potomac River, *Earth Resources Technology Satellite(ERTS), Multispectral scanners, Nanticoke River Marsh(Chesapeake Bay), Chicago, Gary(IN), New York Bight, Air pollution.

The first Earth Resources Technology Satellite (ERTS-1), launched July 23, 1972 by NASA, carries a multispectral scanner (MSS). A second imaging system, the return beam vidicon (RBV), malfunctioned soon after launch and was deactivated. ERTS-1 orbits at an altitude of 920 km, and reoccupies the same orbital path every 18 days. The MSS records a scene simultaneously on four bands (in micrometers): 0.5-0.6 (green), 0.6-0.7 (red), 0.7-0.8 (near infrared), and 0.8-1.1 (near infrared). A 185-km-square image is produced, which is converted to digital data and telemetered to an earth-based receiving station. The final data products are digital tapes, black and white images of individual bands, and false color composites of several bands. ERTS imagery is about 70-80 m. About 330 projects currently use ERTS data, of which about 27 are directly related to environmental problems. Air pollution, fresh water and ocean water pollution, disrupted land surfaces, and regional and local environmental management planning are some of the environmental uses made of the data. ERTS images were used to produce an ecozone map of New Jersey, as well as a vegetation classification map of the Nanticoke River Marsh on Chesapeake Bay. Weather effects of airborne particulate plumes from Chicago and Gary (IN) were studied. Other projects on the Potomac River and New York Bight are also discussed. (Lynch-Wisconsin)
W78-04694

AIRCRAFT AND SATELLITE MONITORING OF LAKE SUPERIOR POLLUTION SOURCES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
J. P. Scherz, and J. F. Van Domelen.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section VIII, p. 1-27. 12 fig, 15 ref. NG1 50-002-127.

Descriptors: *Remote sensing, *Aerial photography, *Water pollution sources, *Turbidity, Satellites, *Lake Superior, Minnesota, Eutrophication, Water quality, Aircraft, Monitoring, Suspended solids, Mapping, Secchi disk, *Earth Resources Technology Satellite(ERTS).

The use of aerial photography could have prevented the poor siting of an $8 million water intake on Lake Superior in turbid, unpotable water. ERTS and aircraft imagery clearly showed the location of the rubid water, and also showed clear water areas which would have made good sites. The Lake Superior work is an example of how aerial photography can be a valuable tool for water quality research. Surface reflections and bottom effects, which are useful only for detection of oil spills and mapping bottom vegetation, must be screened out for water quality monitoring, and ground truth data are needed to verify and calibrate aerial photographs. The most significant difference between images from aircraft and from satelites is the amount of atmosphere between the ground and the camera of scanner. Careful analysis of imagery and water samples make quantitative measurements of turbidity possible, as well as the correlation of turbidity with suspended solids and other water quality parameters. The secchi disk can be used to determine whether bottom effects pose a problem in a given situation. (Lynch-Wisconsin)
W78-04695

A SEARCH FOR ENVIRONMENTAL PROBLEMS OF THE FUTURE,
Battelle Columbus Labs., OH.
J. E. Flinn, A. A. Levin, and J. R. Hibbs.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section VIII, p 67-97. 6 tab, 26 ref. EPA 68-01-1837.

Descriptors: *Environmental effects, *Forecasting, *Projections, Future planning(Projected), Pollutant identification, Industrial production, Air pollution, Energy, Trace elements, Toxins, Wastes, Radiation, Potable water, Irrigation, Social aspects, Particulates.

To assist in long-term environmental planning, ten serious problems which are likely to exist in the near future were identified and ranked through several analytical steps. Initially, three categories of human activities were screened: (1) industrial, (2) environmental, (3) societal change and trends. A list of problems with associated pollutant 'stressors' was generated, and repeated occurrence of stressors, such as heavy metals, was noted. Problem statements were combined and then grouped into these nine general areas: pollution control residues, industrial production-consumption residues, energy supply, toxic and hazardous substances, air pollution, water pollution, ecological effects, radiation and sound, and social aspects. Nine factors were used to select and rank the ten major problems: toxicity, persistence, pervasiveness, volume of substance, number of people affected, ecological complexity, technological complexity, social/political complexity, and research needs. The ten problems were, in order: (1) impact of new energy contaminants, (2) geophysical modifications of the earth, (3) metal trace element initiatives, (4) hazardous and toxic chemicals, (5) automotive emissions, (6) waste disposal, (7) radiation, (8) fine particulates, (9) drinking water contamination, (10) irrigation (impoundment) practices. Each problem is discussed separately, and projections for the future are made. (Lynch-Wisconsin)
W78-04696

SENSOR UTILIZATION IN NEW ENGLAND,
Environmental Protection Agency, Boston, MA. Region I.
H. McCammon.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section IX, p 1-5.

Descriptors: *New England, *Remote sensing, *Monitoring, Effluents, Thermal pollution, Eutrophication, Planning, Runoff, Agriculture, Industrial wastes, Powerplants, Oil spills, Land use, Pollutant identification.

Use of remote sensing could provide a beneficial overview of New England's varied environmental problems, such as thermal plumes from power plants, air emissions and effluents from isolated ural industrial pockets, runoff and heat island build-up from congested urban-industrial areas, mining and ocean dumping operations, eutrophication in lakes and estuaries, and rural community development. Infrared detection with resolution to 1C isotherms should be used on overflights of the 49 major power plants to document the extent of thermal plumes. Sludge blankets formed in rivers and lakes adjacent to pulp and paper mills, as well as oil spills from petroleum terminals and storage areas, could be detected and quantified using remote sensing, and monitoring of particulate emissions and metal wastes could be improved. Aerial surveys could improve knowledge of nonpoint pollution sources, changes in effluents as secondary sewage treatment plants convert to tertiary, the effect of urban storm water runoff on

river channels, the nature and depth of rural soil cover in relation to ability to assimilate septic tank drainage, and the impact of highway construction on watersheds. In land use planning and coastal zone management, aerial monitoring would be invaluable for evaluating soil provile, geology, topography, vegetative cover, water resources, and salt water intrusion into ground water aquifers. (Lynch-Wisconsin)
W78-04697

ENVIRONMENTAL MONITORING NEEDS IN REGION V,
Environmental Protection Agency, Chicago, IL. Region V.
C. Risley, Jr.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section IX, p 18-20.

Descriptors: *Great Lakes Region, *Monitoring, *Water pollution, *Water quality, *Water quality control, Nutrients, Lakes, Waste disposal, Effluents, Fish, Great Lakes, Pollutant identification.

Environmental quality of the Great Lakes area is the major concern of EPA's Region V. A status review shows that water quality in Lake Superior is, in general, high; impairment is limited to localized areas of waste discharge, although the Reserve Mining Co. discharge at Silver Bay, MN, has had widespread impact. Lake Michigan water quality is very good in open waters and the Straits of Mackinac, but in the southern part biomagnification of DDT and PCBs ash halted the sale of salmon, trout, and other species. Waste discharge problems occur in Calumet, Milwaukee, and Green Bay. The worse impairment in the Lake Huron area is in the southeast corner of Georgian Bay and in Saginaw Bay; the Saginaw River is a major source of PCBs. In Lake Erie anoxic conditions in the hypolimnion of the central basin recurred in 1972, and low oxygen levels were reported in the western and eastern basins. Recovery in the lake in not expected until several years after nutrient and pollutant loadings are reduced. Nutrients and dissolved solids enter Lake Ontario primarily from the Niagara River, which connects lakes Erie and Ontario. Impairment is mainly confined to near-shore waters. In the Great Lakes problems of floating oil and scum, discoloration, solids, phenols, heavy metals, and bacteria are frequent. On 15 April 1972 the U.S. and Canada entered into the Great Lakes Water Quality Agreement. A summary of monitoring efforts is given. (Lynch-Wisconsin)
W78-04698

COMMENTS ON ENVIRONMENTAL MONITORING IN REGION VII AND SOME MONITORING PLANS AND NEEDS PREPARED FOR SECOND CONFERENCE ON ENVIRONMENTAL SENSORS,
Environmental Protection Agency, Kansas City, MO. Region VII.
A. Alexander.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section IX, p 23-35.

Descriptors: *Central U.S., *Monitoring, *Remote sensing, Agriculture, Iowa, Kansas, Missouri, Nebraska, Aerial photography, Thermal pollution, Feed lots, Air pollution, Runoff, Water pollution.

The major industry in EPA's Region VII (Iowa, Kansas, Missouri, and Nebraska) is agriculture. Although the Region has its share of severe pollution incidents, such as industrial spills and feedlot runoff, there are no severe chronic pollution problems. The four states conduct routine and special air and water quality monitoring as part of their control programs. Aerial 35 mm photography of feedlot operations has been used to determine lot size, drainage characteristics, livestock load, and wastewater retention pond conditions as related to conformity to NPDES standards. Flying time of about 150 days is required to cover 7,500 feedlots in the four states; aerial surveillance can save an estimated 50-75% in cost and manpower over ground methods. However, aerial photography from 5,000 and 8,000 ft of feedlots in Nebraska was not found to be useful for ascertaining pollution potential. Thermal and color infrared imagery was used in an unsuccessful attempt to locate natural brine seeps in the Republican and Kansas River Basins; failure was attributed to the weakness and small size of the brine seeps. Efforts to detect algae and weeds in the Big Piney River and several reservoirs in Missouri using infrared photography were partially successful. Thermal scans were used successfully to detect plumes of cooling water from power plants, and unsuccessfully to locate wastewater outfalls in the Kansas City area. (Lynch-Wisconsin)
W78-04699

5B. Sources Of Pollution

LEACHATE PRODUCTION AT SANITARY LANDFILL SITES,
Ayres (Owen) and Associates, Inc., Eau Claire, WI.
P. Dass, G. R. Tamke, and C. M. Stoffel.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE6, Proceedings Paper 13406, p 981-988, December 1977. 1 fig, 4 tab, 9 ref, 1 append.

Descriptors: *Leaching, *Landfills, *Waste disposal, Water pollution, Water pollution sources, Runoff, Precipitation(Atmospheric), Groundwater movement, Percolation, Soil water, Groundwater, *Leachates, Pollutants, Solid wastes, Analytical techniques, Data processing, Path of pollutants, Leachate production.

It is becoming increasingly important to minimize the quantity of leachate produced at a sanitary landfill site to reduce contamination of groundwater and surface water. The water balance approach was used to estimate the amount of leachate produced at a sanitary landfill site. The method was applied to predict leachate at an actual landfill site. Runoff coefficients used to calculate monthly runoff from the monthly precipitation in the water balance method were evaluated based upon past precipitation data. The runoff coefficients customarily used in the design of storm sewers are for 5 yr to 10 yr frequency storms. Use of such runoff coefficients in the water balance method presented here would produce much higher values for runoff and thereby would underestimate the quantity of leachate. (Sims-ISWS)
W78-04201

EFFECTS OF URBAN LAKES ON QUANTITY AND QUALITY OF BASEFLOW,
Wisconsin Univ.-Milwaukee. Dept. of Geological Sciences.
D. S. Cherkauer.
Water Resources Bulletin, Vol. 13, No. 6, p 1119-1130, December 1977. 5 fig, 1 tab, 5 ref.

Descriptors: *Base flow, *Lakes, *Urbanization, *Water quality, Watersheds(Basins), Streams, On-site investigations, Sampling, Stream gages, Groundwater, Temperature, Water temperature, Hydrogen ion concentration, Specific conductivity, Ions, Chlorine, Sodium, Calcium, Magnesium, Salts, Water pollution, Pollutants, Hydrology, Road salts.

Man-made lakes have significant impacts on the hydrologic conditions in the watershed in which they are built. Reported herein was the examination of the nature of the impact upon baseflow by comparing baseflow conditions at the outlet of the lakes with those elsewhere in the watershed. Situated in the upper reaches of a small watershed, the lakes studied have only a minor effect upon the magnitude of baseflow discharge, increasing it slightly from October to January and decreasing it from May to September. Baseflow quality is affected substantially. Natural dissolved ions, as represented by magnesium, generally are decreased in concentration and total load by the lakes. Road salt related ions are increased substantially in both concentration and total load in the baseflow. Surface runoff stored in the lakes is extremely enriched in salt in the winter, and the storage capacity of the lakes is sufficient to maintain winter salt concentrations in the baseflow near the lakes until summer. The storage effect also tends to damp out seasonal fluctuations in baseflow chloride content which are extreme in suburban watersheds. The difference in quality between lake and non-lake baseflows and the linear distance needed for complete mixing were used as measures of the magnitude and distal extent of the lake effect on baseflow quality. (Sims-ISWS)
W78-04206

AGRICULTURAL CHEMICALS IN THE ENVIRONMENT (AGROCHEMIKALIEN IN DER UMWELT),
VEB Gustav Fischer Verlag, Jena (East Germany).
For primary bibliographic entry see Field 5C.
W78-04207

DISPERSION OF PROPOSED THEODORE INDUSTRIAL PARK EFFLUENTS IN MOBILE BAY, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
R. C. Berger, Jr, and M. J. Trawle.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 656, Price codes: A09 in paper copy, A01 in microfiche. Miscellaneous Paper H-77-3, March 1977. 189 p, 177 fig, 1 tab.

Descriptors: *Dispersion, *Effluents, *Bays, *Alabama, *Model studies, Laboratory tests, Dye releases, Dye dispersion, Dyes, Tides, Tidal effects, Tidal waters, Rivers, Industries, Industrial wastes, Water pollution, Water pollution sources, *Path of pollutants, Data collections, Estuaries, *Mobile Bay(Ala), Theodore Industrial Park(Ala), Hydraulic models.

An existing comprehensive physical model that correctly reproduced tides, tidal currents, and density currents throughout the entire Mobile Bay was used to determine the distribution characteristics in Mobile Bay of effluents from four possible discharge locations. No attempt was made to analyze the results of the dye dispersion tests or to draw any conclusions from the results. The dyes used in the model tests were conservative and so did not decay with time. Therefore, appropriate decay rates should be applied to the model test data as a basis for predicting prototype conditions. (Sims-ISWS)
W78-04229

FORMATION OF POLYCHLORINATED AROMATIC COMPOUNDS DURING AQUEOUS CHLORINATION,
Waterloo Univ. (Ontario). Centre for Graduate Work in Chemistry.
J. G. Smith, R. B. McCall, and P. K. Chan.
Environmental Pollution, Vol. 14, 1977, p 289-296, 3 tab, 23 ref.

Descriptors: *Water pollution, *Pollutants, *Chlorination, *Polychlorinated biphenylls, Water pollution sources, *Aromatic compounds, Chlorine, Chemical reactions, *Napthalene, *Biphenyll.

This study is concerned with the reaction between typical organic pollutants and aqueous solutions of active chlorine, particularly the reaction of naphthalene and biphenyll. It was found that the extent of reaction is dependent upon the pH of the solution and the concentrations of both the aromatic hydrocarbon and the active chlorine. Naphthalene was appreciably more reactive than biphenyll and both chlorinated biphenylls examined were less reactive than biphenyll itself. (Chilton-ORNL)
W78-04236

TRACE METAL CONTAMINATION OF BLUEGILL (LEPOMIS MACROCHIRUS) FROM TWO INDIANA LAKES,
Prudue Univ., Lafayette, IN. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W78-04243

ANALYSES OF NATIVE WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED FROM THE ATCHAFALAYA RIVER AND ATCHAFALAYA BAY,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-04245

WATER-QUALITY EFFECTS ON BAKER LAKE OF RECENT VOLCANIC ACTIVITY AT MOUNT BAKER, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
G. C. Bortleson, R. T. Wilson, and B. L. Foxworthy.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $2.00. Professional Paper 1022-B, 1977. 30 p, 8 fig, 1 plate, 4 tab, 29 ref.

Descriptors: *Water pollution sources, *Lakes, *Volcanoes, *Path of pollutants, *Washington, Reservoirs, Inflow, Water chemistry, Water quality, Thermal stratification, Chemical stratification, Evaluation, *Baker Lake(Wash), *Mount Baker, Puget Sound region.

Increased thermal activity on Mount Baker, Wash., which began in 1975, focused attention on the possibility of volcanic eruptions or other hazardous events. However, the greatest undesirable natural results found after one year of the increased activity are local pollution of the air and of some water resources, including Baker Lake. Baker Lake is a hydropower reservoir fed in part by Boulder Creek, which drains the Sherman Crater part of Mount Baker. Boulder Creek carries into the lake sizeable loads of acid and dissolved minerals derived mainly from sulfurous gases and fumarole dust from Sherman Crater. A layer of acidic Boulder Creek water was found in Baker Lake extending at least 0.3 miles, but the lake probably could assimilate indefinitely the acid loads measured during 1975. Arsenic, selenium, and mercury found in Boulder Creek water would not reach the limits recommended by the U. S. Environmental Protection Agency for the public water supplies unless their concentrations increased severalfold. However, even if the acid load from Boulder Creek does not greatly increase, occasional light fish mortalities may result near the mouth of the creek; greater acid and mineral loads could be more harmful. (Woodard-USGS)
W78-04260

GEOCHEMICAL EFFECTS OF RECHARGING THE MAGOTHY AQUIFER, BAY PARK, NEW YORK, WITH TERTIARY-TREATED SEWAGE,
Geological Survey, Mineola, NY. Water Resources Div.
S. E. Ragone.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $1.40. Professional Paper 751-D, 1977. 22 p, 14 fig, 9 tab, 26 ref.

Descriptors: *Artificial recharge, *Aquifers, *Tertiary treatment, *Sewage, *Chemical reactions, Geochemistry, *New York, Water chemistry, Oxidation-reduction potential, Sorption, Ion exchange, Groundwater recharge, Data collections, Evaluation, *Bay Park(NY), *Magothy aquifer(NY).

Thirteen recharge tests using tertiary-treated sewage (reclaimed water) and six tests using city (drinking) water were completed between 1968 and 1973 as part of an experimental recharge program at Bay Park, New York. In the longest test, reclaimed water was injected during 84.5 days over a 199-day period. Although iron concentration of reclaimed water and native water in the recharge zone is less than 0.5 mg/liter, the iron concentration in samples taken 20, 100, and 200 feet from the recharge well approached 3 mg/liter at times. Within a 20-ft radius of the recharge well, dissolved oxygen in the reclaimed water oxidized pyrite and caused iron to be released to solution. Because the amount of iron in water increases with distance from the recharge well even though dissolved oxygen is no longer present in water reaching the 20-ft radius, the exact dissolution mechanism is not understood. Some cation exchange occurs. Ammonium and potassium cations exchange with the proton in clay, resulting in a decrease in pH of over 1 pH unit at times. Phosphorus and organic compounds can react chemically and biologically to degrade water quality. Reclaimed water contains an average of 0.17, 0.07, and 9 mg/liter of phosphate, MBAS (methylene blue active substances), and COD (chemical oxygen demand), respectively. During recharge, phosphate concentrations remain at native-water levels at the 20-, 100-, and 200-foot observation wells, which indicates retention by the aquifer; MBAS and COD are partly retained at the 100- and 200-foot wells, presumably by adsorption reactions. (Woodard-USGS)
W78-04261

SUBMARINE SEEPAGE OF NATURAL GAS IN NORTON SOUND, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab., and Geological Survey, Seattle, WA. Geology Div.
J. D. Cline, and M. L. Holmes.
Science, Vol 198, No 4322, p 1149-1153, December 16, 1977. 2 fig, 1 tab, 40 ref.

Descriptors: *Water analysis, *Sounds, *Alaska, *Natural gas, *Seepage, Bottom sampling, Chemical analysis, Organic compounds, Geology, Sediments, Data collections, Water pollution sources, Evaluation, *Norton Sound(Alaska), Hydrocarbons, Methane/ethane ratio.

Unusual concentrations of dissolved two- to four-carbon alkanes were observed in the waters in Norton Sound in a localized area approximately 40 kilometers south of Nome, Alaska, in 1976. The hydrocarbons were identified in the near-bottom waters downcurrent for more than 100 kilometers from a sea-floor point source. Preliminary dynamic modeling estimates of the initial gas phase composition predict methane/ethane and ethane/propane ratios of 24 and 1.7, respectively, assuming the hydrocarbons were introduced by bubbles. The low ethane/propane ratio is indicative of gas from a liquid petroleum source rather than from nonassociated or biogenic natural gas. Preliminary data on the structural geology of Norton Basin lend support to the interpretation based on the hydrocarbon plume. Unconformably truncated strata dip basinward from the seep locus; acoustic anomalies and numerous steeply dipping faults in the immediate vicinity of the seep are corroborating evidence that shallow gas- or petroleum-charged sediments and strate coincide with avenues for migration of mobile hydrocarbons to the sea floor. These factors, taken in concert with the sedimentological regime, the recent revision (increase) of basin depth estimates, and the highly localized hydrocarbons source, strongly suggest a thermogenic rather than a recent biogenic origin for these gaseous compounds. (Woodard-USGS)
W78-04262

A LOOK AT GROUND WATER RESEARCH.
For primary bibliographic entry see Field 2F.
W78-04290

GLOBAL DISTRIBUTION OF CARCINOGENIC POLLUTANTS IN WATER,
National Cancer Inst., Bethesda, MD.
H. F. Kraybill.
Annals of the New York Academy of Sciences, Vol. 298, p 80-89, September, 1977, 1 fig, 6 tab, 35 ref.

Descriptors: *Carcinogens, *Pollutants, Water supply, Potable water, Chlorination, Ozonation, Pesticides, Cancer, Organic compounds.

Modern analytic techniques now permit the detection of contaminants at very small concentrations in solution, including those contaminants which are suspect carcinogens. While animal experiments involving large doses of these substances over short time periods are revealing, difficulties arise in extrapolating these results to humans, who encounter low-level doses over extended time periods. In appraising the potential hazards of toxic agents, it is generally recognized that there may be a 'no effect' or apparent threshold on dose-response relationships; for carcinogens, however, the existence of such a threshold has not been established. The worldwide occurrence of carcinogenic contaminants, the cumulative effects of carcinogens in the food chains, the formation of carcinogens as a direct result of water treatment practices, the interaction of water-borne contaminants with each other and with other environmental agents, and many similar potential problems all form a complex web which can only be unraveled by further research. (Eberle-NWWA)
W78-04304

ON THE WATER EXAMINATIONS OF THE RIVERS AT THE PIEDMONT DISTRICT OF MT. TOKACHI IN AND AROUND KAMIFURANO CHO, (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
T. Nishi, K. Sugimoto, M. Takahashi, T. Sakai, and M. Yonekawa.
Res Bull Obihiro Zootech Univ Ser I. 8(3), p 319-343, 1974.

Descriptors: *Japan(Kamifurano cho), Piedmont, Rivers, Water quality, Hydrogen ion concentration, Water chemistry, Path of pollutant, Water pollution sources.

The abnormal water of rivers which flow at the foot of Tokachi-dake, an active volcano having a record of many eruptions, was observed. Sixteen observation points were set up: 6 on the Furano River; 8 tributary rivers of Furano River; and 2 places at the upper and lower junctions of the Furano and Sorachi Rivers. Samples of the river water (12) were taken from May 1969-March 1970 and examinations of the water covering 29 items were made. The upper stream of Furano River which rises from the new crater of Tokachi-dake shows high acidity, low pH value and large quantities of sulfalic acid ion, dissolved solids, total hardness and Ca- and Mg ions. In the 83rd or 4th branch rivers which flow into the Furano River, the highest acidity and other parameters next to the upper stream of the Furano River was Nukkakushi-Furanui River which rises from the old crater of Mt. Kami-Horokametoku. The next were the Korukoni-Ushibetsu-, Shibukeushi- and

Ehorokanbetsu Rivers. The abnormal water of these rivers are related to the eruptions of volcanoes. In the 3rd branch, the water of the 4 rivers Pirika-, Furano-, Kajika-, Ebanama-Ehorokanbetsu- and Beberui River did not appear abnormal. When comparing the water of the lower stream at the junction where the Furano River flows into the Sorachi River the river is influenced by the special characteristics of the Furano River. In the study of these river, the progress of pollution and the inclusion of heavy metals was not included.--Copyright 1975, Biological Abstracts, Inc.
W78-04313

DISTRIBUTION AND ECOLOGY OF SUBMERGED MACROPHYTES IN STREAMS OF THE ERDINGER MOOR (MUENCHEN PLAIN), (IN GERMAN),
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany). Inst. of Plant Ecology.
G. Kutscher, and A. Kohler.
Ber Bayer Bot Ges Erforsch Heim Flora 47, p 175-228, 1976.

Descriptors: *Submerged aquatic plants, Macrophytes(Submerged), Chara-hispida, Chara-vulgaris, Juncus-alpino-articulatus, Juncus-subnodulosus, Nitella-opaca, Potamogeton-coloratus, Sparganium, *Water quality.

The distribution and ecology of the submerged macrophytes depends on the water quality of the streams. Potamogeton coloratus, is completely absent, although this area should offer a favorable substrate for this plant. Especially common are the Characeae, such as Juncus subnodulosus and J. alpino-articulatus with Sparganium minimum, Chara hispida, C. vulgaris and Nitella opaca.--Copyright 1978, Biological Abstracts, Inc.
W78-04314

MIXING LENGTH FOR REPRESENTATIVE WATER QUALITY SAMPLING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04334

RELATIONSHIPS BETWEEN WATER CHEMISTRY AND PRIMARY PRODUCTS IN STREAMS, A LIMNOLOGIC PROBLEM, (IN GERMAN),
Zurich Univ. (Switzerland). Inst. fuer Pflanzenbiologie.
For primary bibliographic entry see Field 5C.
W78-04339

EFFECTS OF STORM FREQUENCY ON POLLUTION FROM URBAN RUNOFF,
Rutger - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr, J. V. Hunter, and S. L. Yu.
Journal Water Pollution Control Federation, November 1977, p 2243-2248. 9 fig, 1 tab, 5 ref. OWRT C-5341(No 4239)(9).

Descriptors: Water pollution, *Water pollution sources, *Storm runoff, *Antcedent precipitation, Biochemical oxygen demand, Nutrients, Phosphates, Runoff, *Modeling(Runoff pollution).

A test is reported of the common assumption that pollution loading in a storm varies with the length of time elapsed since the preceeding rainfall. This assumption is incorporated in the Stormwater Management Model (SWMM) of EPA. The data available covered a number of storms in the Saddle River, N.J., and pollutant loadings were compared for total suspended sediments, BOD, phosphates and heavy metals. With few exceptions, pollution loadings did not appear to vary with time elapsed since previous rainfall. Further testing of this assumption and development of more realistic models for storm runoff pollution is indicated.
W78-04342

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO. 4, THE PRODUCTION, USE AND DISTRIBUTION OF PHTHALIC ACID ESTERS IN CANADA,
Canada Centre for Inland Waters, Burlington (Ontario).
T. D. Leah.
Report Series No. 47, 1977. 67 p, 2 fig, 15 tab, 104 ref, 3 maps.

Descriptors: *Wastes, *Water pollution, *Soil contaminants, *Biota, *Toxicity, Industrial production, Public health, Hazards, Disposal, Investigations, Data collections, *Canada, *Phthalic acid esters, Distribution.

This study is the fourth in the Environmental Contaminants Inventory Series. The first Chapter contains an introduction to and summary of the material detailed throughout the report. The second and third chapters review the literature on ortho-phthalic acid esters (PAEs) in the environment and their effects on human health. By combining information on exposure and toxicity, an attempt is made to assess the present hazard to human health and the environment posed by observed levels of PAEs in the environment. In the fourth chapter, the production and use of PAEs in Canada is analyzed for the year 1973. The fifth chapter covers the releases of PAEs to the environment from production and processing, and from the use and disposal of articles that contain PAEs. Estimates indicate that in 1973 releases from production and processing activities comprised approximately 20 percent of the total, whereas use and disposal activities accounted for the remaining 80 percent. These releases have been presented in terms of major drainage basins to give the data more regional significance. The sixth chapter reviews the chemistry and properties of PAEs, the major processes used in producing and fabricating flexibilized (plasticized) poly (vinyl chloride) and the use of related chemicals such as phthalic anhydride and terephthalic acid. The final chapter summarizes the conclusions and recommendations based on the findings of this study. Throughout the report, the data are clarified through the use of a material flow charts, tables, and maps. (WATDOC)
W78-04348

SURFACE WATER QUALITY IN CANADA - AN OVERVIEW.
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5G.
W78-04349

NITRILOTRIACETIC ACID (NTA) IN THE CANADIAN ENVIRONMENT,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
D. H. Matheson.
Scientific Series No. 74, 1977. 46 p, 10 fig, 17 tab, 21 ref, 4 append.

Descriptors: *Nitrilotriacetic acid, *Phosphates, *Detergents, *Groundwater, *Sampling, Waste water treatment, Chlorination, Effluents, Degradation(Decomposition), Lakes, River, *Canada, *Lake Ontario, *Hamilton Harbour, Western Lake Ontario, Montreal Metropolitan Area.

Nitrilotriacetic acid (NTA) has been used in Canada since 1970 as a replacement for phosphate in detergents. An extensive monitoring program for NTA residuals in water supplies has been carried out by the Water Quality Branch, Inland Waters Directorate, Department of Fisheries and the Environment, with the close cooperation of the Procter & Gamble Company of Canada, Limited. The program includes a survey of public water supplies across Canada and intensive studies of 13 municipalities and certain unique local situations. To date the findings of this program are: (1) Rapid disappearance of NTA in wastewater treatment plants and in receiving waters has prevented a build up of the concentration of the chemical in the environment despite its expanding use. (2) Very few cases occurred in which the NTA content of drinking water derived from surface sources exceeded 10 ppb. These happened where the raw water was polluted with wastewaters containing NTA and reused before degradation and dilution had reduced the concentration. (3) Shallow groundwaters may be contaminated by NTA by way of faulty septic tanks or disposal pits, but they should be condemned for more urgent sanitary reasons. Municipal groundwater supplies showed little evidence of NTA contamination. (WATDOC)
W78-04350

HEATED DISCHARGE CONTROL AND MANAGEMENT ALTERNATIVES SMALL WATER BODIES AND RIVERS.
MacLaren (James F.) Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5D.
W78-04353

WATER QUALITY SURVEYS ON THE NIAGARA RIVER - 1974,
Department of the Environment, Burlington (Ontario). Water Quality Div.
For primary bibliographic entry see Field 5A.
W78-04358

WATER QUALITY OF URBAN STORM WATER RUNOFF IN THE BOROUGH OF EAST YORK,
W. G. Mills.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 66, 1977. 90 p, 4 fig, 5 tab, 19 ref, 2 append. 74-1-40.

Descriptors: *Water quality, *Storm runoff, *Storm water, *Urban runoff, Parametric hydrology, Surface runoff, Suspended solids, Lead, Phenolic pesticides, Chlorine, Phosphorus, Ammonia, Nitrates, Nitrites, Conductivity, Drainage area, Storm drains, *Canada, Biochemical oxygen demand, Chemical oxygen demand, *Borough of East York(Ont), Kjeldahl nitrogen.

Two study areas were established in the Borough of East York, with one area, Broadview, being abandoned after a short time due to instrumentation problems. The other area, Barrington, was monitored for a period of almost three years. Water quality results are given for eighteen events ar Barrington and three at Broadview. Parameters recorded throughout the study included suspended solids, BOD, lead, phenolic compounds, chlorides, COD, total and dissolved phosphorus, ammonia, Kjeldahl nitrogen, nitrite, nitrate and conductivity. Parameters recorded occasionally included pH, TOC, sodium, potassium, iron, hardness, alkalinity, dissiolved and total solids, sulphates, heavy metals, petroleum hydrocarbons and herbicides. Barrington is an old residential system built in the late 1960s. All tests were run on separated storm water from the new storm sewer system. The drainage area was 22.4 hectares, of which 17.4 hectares contributed runoff to the sewer system, since the roof drainage was connected to the older combined sewer system. Results are provided in tabular form, and include the peak concentrations of all parameters in all events monitored, peak mass loadings for all events (mass loading being the rate at which the parameter is being carried by the runoff), the mass of material carried by runoff in each event, and the flow-weighted mean concentration for each event. Results are also provided in graphical form, including 291 graphs (all of which are available on request). Each graph shows the rainfall, concen-

tration and mass loading for each parameter in each event. (WATDOC)
W78-04359

THE EUTROPHIC POTENTIAL OF WAHIAWA RESERVOIR SEDIMENTS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W78-04366

METHANE IN LAKE ERIE: ANALYSIS OF MECHANISMS OF PRODUCTION AND OF AMOUNTS PRODUCED,
Ohio State Univ., Columbus. Dept. of Microbiology.
J. I. Frea, T. E. Ward, and G. E. Mallard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 981, Price codes: A08 in paper copy, A01 in microfiche. Ohio Water Resources Center, Ohio State University, Completion Report No. 488, March 1977. 153 p, 40 fig, 28 tab. OWRT A-040-OHIO(1).

Descriptors: *Methane, *Methane bacteria, Gases, Carbon cycle, Cycling nutrients, Anaerobic digestion, Biodegradation, Aquatic bacteria, Sediments, Anaerobic bacteria, Gas chromatography, *Lake Erie, Microbial degradation, Water pollution sources, *Path of pollutants, Distribution, Lake sediments, *Methane production rates, *Methanobacterium, *Methanospirillum, *Methanosarcina, Fluorescent antibody.

Microbial methanogenesis in the sediment and water column of the Western and Central Basins of Lake Erie was studied. Year to year methane production varies, but relative methanogenesis by geographical location is constant with near shore and harbors having highest production. The Western Basin generally supports more methane production than the Central Basin. Four species of methanogenic bacteria, Methanobacterium ruminantium, Methanobacterium strain M.Q.H., Methanospirillum hungatii, and Methanosarcina barkerii, were shown by the direct fluorescent antibody technique to be distributed in specific locations in the Lake and its harbors. Laboratory study of these same methanogenic species showed that they produce an average of 1.2 umoles of methane per hour per 10 to the 8th power cells. Methane accumulation does not inhibit methane production; hydrogen depletion terminates production.
W78-04373

OIL POLLUTION IN THE MEDITERRANEAN SEA,
Mediterranean Regional Oil Combating Center, Manoel Island (Malta).
For primary bibliographic entry see Field 5G.
W78-04403

VARIATIONS IN THE LEVELS OF MINERAL AND ORGANIC MATERIALS CARRIED BY A CANALIZED RIVER, THE LOT, (IN FR. *i*CH),
Toulouse-3 Univ. (France). Lab. d'Hydrobiologie.
For primary bibliographic entry see Field 5C.
W78-04441

THE DISTRIBUTION, COMPOSITION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE NORTHEASTERN GULF OF ALASKA, SOUTHEASTERN BERING SHELF AND LOWER COOK INLET,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
R. A. Feely, and J. D. Cline.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 89-179, March 1977. 35 fig, 10 tab, 35 ref.

Descriptors: *Water pollution sources, *Baseline studies, *Sediment transport, Ocean currents, Bottom sediments, Alaska, Resources development, Distribution, Path of pollutants, *Outer Continental Shelf, Suspended matter, Particulate matter, Bering Sea, Gulf of Alaska.

The most significant conclusions of the suspended matter program in the southeastern Bering Shelf are listed: The surface suspended matter distributions appear to follow the general pattern of circulation in Bristol Bay. Terrestrial suspended matter from the northern rivers is generally carried to the west and southwest by counterclockwise currents. Large plumes of suspended matter can be seen extending to the southwest. In the region north of Unimak Pass large suspended matter plumes have been observed in the early summer which appear to be the result of increased productivity during the summer months. Sharp increases in suspended matter concentrations near the bottom indicate that resuspension of bottom sediments is occurring. In the Gulf of Alaska the distribution of suspended matter at the surface appear to follow the general pattern of water circulation. Significant variations can be related to seasonal variations in the discharge of terrestrially derived suspended matter, seasonal variations in primary productivity, and occasional offshore transport of suspended matter by wind-generated eddies. A bottom nepheloid layer is present throughout most of the Gulf. Studies of the chemical composition of the suspended matter show significant spatial and seasonal variations. (Sinha-OEIS)
W78-04460

DISTRIBUTION OF LIGHT HYDROCARBONS, C1-C4, IN THE NORTHEAST GULF OF ALASKA, LOWER COOK INLET, SOUTHEASTERN BERING SHELF, NORTON SOUND AND SOUTHEASTERN CHUKCHI SEA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
J. Cline.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 180-268, March 1977. 39 fig, 6 tab, 27 ref.

Descriptors: *Water pollution sources, *Baseline studies, *Oil spills, *Seepage, Resources development, Alaska, Fossil fuels, Methane, Distribution, Path of pollutants, *Outer Continental Shelf, *Bering Sea, *Gulf of Alaska, Chukchi Sea, Hydrocarbons, Aliphatic hydrocarbons, Petroleum hydrocarbons.

The development of petroleum resources in the Gulf of Alaska may result in the release of toxic hydrocarbons to the marine environment with possible deleterious effects on the pelagic, benthic, and intertidal biota. It is of environmental significance that baseline levels of both naturally occurring and petroleum-derived hydrocarbons be established prior to the development of fossil fuel resources in the area. Low molecular weight hydrocarbons (LMWH) studies were carried out in the northeast Gulf of Alaska and the southeastern Bering Sea to determine the distributions and natural sources of methane, ethane, ethylene, propane, propylene, isobutane and n-butane. Known offshore seeps were investigated to ascertain the composition of natural gas seeps and to evaluate the merits of naturally injected LMWH as tracers of petroleum input. Baseline surveys have been completed in the northeast Gulf of Alaska, southeastern Bering Sea, Norton Sound, and southeastern Chukchi Sea. The data obtained to date is probably sufficient to delineate the background levels of the low molecular weight aliphatic hydrocarbons to be expected in a future monitoring activity. (Sinha-OEIS)
W78-04461

SUBMARINE SEEPAGE OF NATURAL GAS IN NORTON SOUND, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
J. D. Cline, and M. L. Holmes.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 269-289, March 1977. 2 fig, 1 tab, 38 ref.

Descriptors: *Baseline studies, *Water pollution sources, Resources development, Alaska, Natural gas, Seepage, *Outer Continental Shelf, Norton Sound, Alaska, Alkanes, Hydrocarbons.

During a 1976 survey of petroleum hydrocarbon distributions in the waters of Norton Sound, relatively large concentrations of dissolved C2-C4 alkanes were observed in a localized area approximately 40 km south of Nome, Alaska. The hydrocarbons, apparently originating from a point source in the sea floor, could be identified in the near-bottom waters down-current for more than 100 km. Concentrations of ethane, propane, iso- and n-butanes near the locus of the seep were above ambient levels by a factor of 10 or more. Preliminary estimates of the composition of the initial gas phase composition predict methane:ethane and ethane:propane ratios of 24 and 1.7, respectively, assuming the hydrocarbons were introduced via bubbles. Taken at face value, the low C2:C3 ratio is indicative of gas from a liquid petroleum source rather than from nonassociated or biogenic natural gas. Preliminary data on the structural geology of Norton Basin support this interpretation based on the observed chemical and physical characteristics of the plume. (Sinha-OEIS)
W78-04462

NATURAL DISTRIBUTION OF TRACE HEAVY METALS AND ENVIRONMENTAL BACKGROUND IN ALASKAN SHELF AND ESTUARINE AREAS,
Alaska Univ., College. Inst. of Marine Science.
D. C. Burrell.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 290-506, March 1977. 31 fig, 70 tab, 203 ref. No. 03-5-022-56.

Descriptors: *Pollutant identification, *Baseline studies, *Water pollution, Resources development, Alaska, Oil pollution, Heavy metals, Toxicity, Distribution, Path of pollutants, *Outer Continental Shelf, Berging Sea, Beaufort Sea, Gulf of Alaska, Mytilus, Fucus.

The scope of this project included lower Cook Inlet, Norton Sound and the southern part of the Chukchi Sea in addition to the three shelf areas (Gulf of Alaska, S. Bering and Beaufort Seas). Baseline collection and analysis of water column samples is now considered to be complete. For the soluble contents analysed to date, viz. Cd, Cu, Pb, Ni, Hg and V, concentrations in filtered seawater from all shelf regions of Alaska are generally lower than commonly accepted oceanic means. As expected for such open ocean areas, distributions are quite uniform. Surficial sediment samples, collected in a uniform, contamination-free fashion in all these areas, show a number of heavy metals have been determined both as concentrations in extractable fractions from the sediment surface and as 'whole rock' totals. In all cases the heavy metal contents are a function of the sediment grain size fractionation and the lithology. The concentrations of particulate heavy metals in the water are related to the particulate sediment load with enhanced-concentrations adjacent to the sediment interface and in coastal waters. The clay minerology of all the fine grained fractions have also been determined. A fairly representative spread of two intertidal benthic species have been analysed.

Data show heavy metal contents as low of lower than other regions. It is noted that the Alaskan shelf regions could well serve as a type example of pristine coastal environments. (Sinha - OEIS)
W78-04463

HYDROCARBONS: NATURAL DISTRIBUTION AND DYNAMICS ON THE ALASKAN OUTER CONTINENTAL SHELF,
Alaska Univ., College. Inst. of Marine Science.
D. G. Shaw.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 507-727, March 19 77. 8 tab, 16 ref, 2 apend. Chiefly data tables and charts. 03-5-022-56.

Descriptors: *Water pollution sources, *Baseline studies, *Pollutant identification, Analytical techniques, Alaska, Resources development, Sediment, Biota, Zooplankton, Seston, *Outer Continental Shelf, *Hydrocarbons, Aromatic hydrocarbons.

Results of hydrocarbon analyses of biota, water, sediment and seston are reported and discussed. In general these analyses show that the Alaskan OCS environments are free of petroleum at the present time. Petrogenic hydrocarbons were detected in intertidal sediments of the Beaufort Sea. It is not yet known to what extent, if at all, anthropogenic sources contribute to these hydrocarbons. Efforts to understand and quantify processes by which hydrocarbons in the water column are transported to the benthic environment are described. The two such processes investigated are the association of hydrocarbons and suspended sediments and the scavenging and sedimenting of hydrocarbon droplets by zooplankton. It appears that at least for the conditions of south central Alaska the former process is not highly effecient. Results about the latter process are not yet available. Brief descriptions of recently begun site specific studies are presented. (Sinha - OEIS)
W78-04464

TRACE METAL CONTENT OF BOTTOM SEDIMENT IN NORTHERN BERING SEA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-04465

MERCURY DISPERSAL FROM LODE SOURCES IN THE KUSKOKWIM RIVER DRAINAGE, ALASKA,
Geological Survey, Menlo Park, CA.
H. Nelson, B. R. Larsen, E. A. Jenne, and D. H. Sorg.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 736-750, March 1977. 2 fig, 1 tab, 17 ref.

Descriptors: *Water pollution sources, *Baseline studies, *Bottom sediments, *Mercury, Alaska, Resources development, Metals, Fresh water, Sea water, *Outer Continental Shelf, Suspended sediment, Cinnabar.

The Kuskokwim River is not industrially polluted, but has anomalous mercury content from cinnabar particles in bottom sediments near natural mineralized sources. To ascertain if physical dilution is the dominant dispersal process in natural rivers, dispersal distance (distance required for Hg content to return to background values) was examined in filtered water, suspended sediment, bulk sediment, and size fractions of heavy mineral concentrates downstream from mineralized areas over 840 km of the Kiskokwim River system. The highest individual Hg anomalies in suspended sediment and filtered water occur near the largest mineralizred sources of tributary streams; however, values decline rapidly downstream. The Hg anomalies in source areas for both water and suspended sediment usually are significantly lower than the bed sediment anomalies, and water values are much lower than any sediment values at a given source. This dispersal pattern of anomalies probably results because most of the mercury appears to be entering the river system as particulate cinnabar in bottom sediment and the diluting effect of water discharge always is greater than sediment discharge in any river, and similarly the bottom sediment load of this river is estimated to be only about 10% of the annual suspended sediment load. (Sinha - OEIS)
W78-04466

CHARACTERIZATION OF ORGANIC MATTER IN SEDIMENTS FROM GULF OF ALASKA, BERING AND BEAUFORT SEAS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
I. R. Kaplan, W. E. Reed, M. W. Sandstrom, and M. I. Venkatesan.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 751-838, March 1977. 46 fig, 11 tab, 15 ref. 03-6-022-35250.

Descriptors: *Water pollution sources, *Pollutant identification, *Baseline studies, *Oil pollution, *Bottom sediments, Environmental effects, Sediments, *Organic matter, Resources development, Alaska, *Outer Continental Shelf, Hydrocarbons, Petroleum hydrocarbons, Gulf of Alaska, Bering Sea, Beaufort Sea.

The paraffin fraction of the high molecular weight hydrocarbons have been identified from sediment samples from the Eastern Gulf of Alaska and the Eastern Bering Sea. In general it has been shown that: The concentrations of total hydrocarbons in surface sediments from both areas, with the exception of one sample near Pribilof Canyon, is low compared to recent marine sediments from other environments; the hydrocarbons in the sediments appear to be derived from a mixture of terrigenous and marine sources. In the Bering Sea, a terrigenous source predominates, while in the Gulf of Alaska, contribution from mainr and terrigenous sources is approximately equal. A series of n-alkanes and unresolved hydrocarbons in the n-C21 to n-23 molecular weight range occurs in some samples from the Bering Sea and many of the sediments of the Gulf of Alaska. The source of these hydrocarbons may be either from petroleum or from unidentified marine organisms. Sediments near the head of Pribilof Canyon appear to contain petroleum derived hydrocarbons. This is in contrast to most other samples of the Bering Sea which have no indications of petroleum addition. Several of the Gulf of Alaska sediments analyzed seem to indicate some petroleum contribution. (Sinha - OEIS)
W78-04467

FULVIC ACIDS, HUMIC ACIDS, AND KEROGENS FROM SEDIMENTS OF THE GULF OF ALASKA AND EASTERN BERING SEA,
California Univ., Los Angeles. Dept of Earth and Space Sciences.
For primary bibliographic entry see Field 5A.
W78-04468

CHARACTERISTICS OF THE SOLUTION ALGORITHMS FOR THE QUAL II RIVER MODEL,
Utah State Univ., Logan.
W. J. Grenney, M. C. Teuscher, and L. S. Dixon.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 151-157, January 1978. 4 fig, 12 ref.

Descriptors: *Model studies, *Simulation analysis, *Water quality, *Algorithms, *Numerical error analysis, Computers, Flow, Jordan River(Utah), Constraints, Equations, Systems analysis, Input-output routines.

The QUAL II river water quality model has been widely used in the past 3 or 4 years for water quality planning. However, application of the model to the Jordan River in Utah has indicated several limitations, the most serious being the instability at large diversions (flow discontinuities). Modifications made to eliminate this problem and to improve the model's applicability are discussed herein. Numerical analysis of the conditions encountered with the Jordan River has indicated that in order to retain reasonable accuracy, the solution algorithm be limited to inverting matrices containing less than 250 equations. This constraint was applied to both dynamic and steady-state conditions. It is concluded that in order to use the QUAL II effectively, the modifications made to the input/output routines and to the solution algorithm are a necessity. (Bell-Cornell)
W78-04479

ENVIRONMENTAL TRANSPORT MODELING OF POLLUTANTS IN WATER AND SOIL,
Oak Ridge National Lab., TN; and Union Carbide Corp., Oak Ridge, TN. Nuclear Div.
M. R. Patterson, C. L. Begovich, and D. R. Jackson.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-7605121, Price codes: A02 in paper copy, A01 in microfiche. (1976). 14 p, 6 fig, 8 ref.

Descriptors: *Pollutant transport, *Water pollution, *Soils, Heavy metals, Particulates, Suspended sediment, Hydrologic cycle, Bulk flow, Time scale, *Environmental effects, Soil erosion, *Simulation analysis, Mathematical models, Systems analysis.

A suite of models is discussed which can be applied to calculation of first order effects in transport of several types of pollutants in water and soil. The materials considered include solids in the form of particulates and soluble forms of the heavy metals. The time scale that is currently being emphasized is discussed, along with the physical size of the area covered by these calculations. The role of the hydrologic cycle is introduced along with the importance of bulk flow and particulate transport, as suspended sediment. The build-up of lead, cadmium, zinc, and copper in the soil near a lead smelter over a six-year period is presented. (Bell-Cornell)
W78-04481

MOBILITY OF HEAVY METAL HUMATES IN SOILS AND SURFACE WATERS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
E. Bolter, and T. R. Butz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 050, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, September 1977. 51 p, 14 fig, 5 tab, 4 ref. OWRT B-114-MO(1). 14-34-0001-6094.

Descriptors: *Heavy metals, Humic acid, Water pollution sources, *Humic acid-heavy metal complexation, *Copper, *Lead, *Zinc, *Cadmium, Solubility, Runoff, Soils, Pollutant identification, Path of pollutants.

The dissolution of heavy metal compounds by humic acids and the formation of humic acid-metal complexes for copper, lead, zinc and cadmium was investigated. The solubility of heavy metal compounds increased sharply with humic acid compared to water with the same pH. The tendency to form humic acid complexes increased in the sequence cadmium, zinc, lead and copper. The tendency to form complexes increased with increasing humic acid concentration and higher pH,

but decreased with increasing electrolyte content of the solution. Runoff samples from a heavily polluted smelter area were in agreement with the laboratory data. Several methods of determining complexation were compared.
W78-04494

PREDICTING POLLUTANT DISPERSION IN RIVERS,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
H. Liu, and J. E. Dieter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 048, Price codes: A02 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, January 1, 1978. 13 p, 4 fig, 16 ref. OWRT A-094-MO(2). 14-34-0001-7053 and 7054.

Descriptors: *Path of pollutants, *Forecasting, Dispersion, Longitudinal dispersion, Open channel, *Pollution(Prediction), Rivers, Streams, Water pollution sources, *Dispersion coefficient.

The purpose was to evaluate and refine a new method proposed by Liu (See W77-05803) to predict the dispersion coefficient of natural streams. It was found that the dimensionless dispersion coefficient Beta, where Beta = U*R3DL/Q2, is directly proportional to the Darcy-Weisbach frictional factor f. This establishes an analogy between one-dimensional dispersion and friction which deserves further investigation. The study also showed the effect of channel cross-sectional geometry on the dimensionless dispersion coefficient Beta.
W78-04495

PHOSPHORUS ACCUMULATION-DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-04501

TOXIC METALS IN SURFACE WATERS FROM COAL ASH,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Envrontemental Studies.
For primary bibliographic entry see Field 5A.
W78-04502

MATHEMATICAL MODELING OF LAND RUNOFF CONTAMINATED BY PHOSPHORUS,
Marquette Univ., Milwaukee, WI.
V. Novotny, H. Tran, G. V. Simsiman, and G. Chesters.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 101-112, January 1978. 12 fig, 21 ref.

Descriptors: *Path of pollutants, *Runoff, *Model studies, *Mathematical models, Pollutants, Water pollution, Sediments, Suspended solids, *Phosphorus, Water quality, Chemicals, Agricultural chemicals, Watersheds(Basins), Hydrology, *Water quality models.

A dynamic model capable of simulating pollutants movement and adsorption in soils was developed. Soil adsorption was treated as a non-conservative kinematic process with adsorption equilibrium described by the Langmuir isotherm. The soil adsorption model then was incorporated into a larger dynamic hydrologic-sediment transport model termed LANDRUN and applied to simulation of phosphorus contamination of runoff from urban and non-urban areas. The model was tested by comparing observed and simulated phosphorus loadings from pilot watersheds. The measured data for sediment and phosphorus were in good agreement with simulated loadings. (Sims-ISWS)
W78-04507

SIMULATION OF DESIGN-STORMS WITH PROBABLE DISTRIBUTIONS IN TIME AND SPACE FOR STORM DRAINAGE SYSTEMS,
Technische Univ., Hanover (West Germany), Inst. fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
For primary bibliographic entry see Field 2B.
W78-04511

THE SIGNIFICANCE OF STORMWATER RUNOFF IN AN URBANIZING WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
C. W. Randall, J. A. Garland, T. J. Grizzard, and R. C. Hoehn.
Progress in Water Technology, Vol 9, No 3, p 547-562, 1977. 8 fig, 7 tab, 5 ref.

Descriptors: *Urban runoff, *Nutrients, *Organic loading, *Waste water treatment, *Virginia, *Watershed management, Water supply, Pollution abatement, Data collections, Sampling, Reservoirs, *Occoquan Reservoir(VA), *Advanced waste water treatment, Secondary effluents.

The Occoquan Creek watershed is located in the northern part of Virginia and occupies an area of 600 mi, consisting of portions of Fairfax, Fauquier, Loudon, and Prince William Counties. The Occoquan Reservoir is a major and critical water supply source for urban development in the Greater Washington, D.C., area. A total of 11 treatment plants are being replaced by advanced wastewater treatment plants. The data from a preliminary investigation showed that organic and nutrient contributions from urban runoff constitute a sizeable fraction of total load and that this source of pollution must be considered in formulating any future policies for the watershed. So far, the construction of elaborate wastewater treatment plants has been emphasized for pollution abatement. This practice needs to be reevaluated, and consideration should be given to control of runoff. (Singh-ISWS)
W78-04512

QUALITY ASPECTS OF AGRICULTURAL RUNOFF AND DRAINAGE,
American Society of Civil Engineers, New York. Task Committee on Agricultural Runoff and Drainage of the Water Quality.
S. Kilman, L. B. Baldwin, M. H. Frere, A. T. Hjelmfelt, Jr, and G. S. McGregor.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 103, No IR4, Proceedings Paper 13439, p 475-479, December 1977. 4 tab, 67 ref.

Descriptors: *Agriculture, *Drainage, *Runoff, *Water quality, Eutrophication, Federal government, Sedimentation, Pesticides, Water management(Applied), Water pollution, Pollutants, Nutrients, Fertilizers, Nitrogen, Phosphorus, Reviews, Federal laws, Pollutant loads.

The ASCE Task Committee on Agricultural Runoff and Drainage summarized the literature and research findings concerning sources of pollutants, nature of downstream impacts, and relationships between pollutant loads and certain physical variables. Agricultural discharges from nonirrigated lands are significant contributors of nitrogen, phosphorus, and pesticides to downstream receiving waters. State-of-the-art knowledge indicates that management practices directed toward control of erosion, control of runoff, and management of fertilizer and pesticide application can reduce total pollutant load carried off-site from agricultural lands. The development of on-site discharge water quality control measures, as contemplated under PL 92-500, must be predicated on detailed surveys of a more specific nature due to the high degree of variability in the factors influencing waterborne pollutant transport. (Visocky-ISWS)
W78-04523

UNUSUAL RESPONSE OF A CUPRIC ION ELECTRODE IN PRAIRIE LAKE WATERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W78-04527

THE EFFECTS ON THE VEGETATION OF THE ADDITIONS OF INORGANIC NUTRIENTS TO SALT MARSH SOILS AT STIFFKEY, NORFOLK,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-04541

GROWTH RESPONSES OF COASTAL HALOPHYTES TO INORGANIC NITROGEN,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-04542

PHOSPHORUS ACCUMULATION--DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
F. L. Spangler, C. W. Fetter, Jr., and W. E. Sloey.
Water Resources Bulletin, Vol 13, No 6, p 1191-1201, December, 1977. 3 fig, 2 tab, 10 ref.

Descriptors: *Bulrush, *Marshes, *Marsh management, *Phosphorus, *Sewage effluents, *Aquatic productivity, Rooted aquatic plants, Wetlands, Freshwater marshes, Aquatic environment, Marsh plants, Phosphorus compounds, Sediments, Pollutants, *Path of pollutants, Wastes, Water pollution, *Water pollution control, Waste water(Pollution), Sewage, Environmental sanitation, Waste water disposal, Productivity, *Wisconsin, Brillion(Wis), Artificial marshes, Phosphorus removal.

Artificial and natural marshes were studied to determine changes in quality of polluted water passing through them. Phosphorus removal ranged from zero to 64%, removals in the 35% range were common. Much of the phosphorus went into sediments and unharvestable plant parts. Harvesting vegetation removed 6% of the phosphorus put into the system. Accumulation of phosphorus during the growing season was about 20 g/sq m, much of which was flushed out after the onset of freezing weather. The amount of phosphorus flushed out can be prevented from entering a lake or stream by handling marsh discharge in one of three ways: irrigate on land, lagoon to recycle later, treat conventionally if facilities are available. (Steiner-Mass)
W78-04545

HEAVY METALS IN SEWAGE SLUDGE MAY MAKE IT UNSAFE FERTILIZER.
For primary bibliographic entry see Field 5E.
W78-04579

HYDROECOLOGICAL INVESTIGATIONS IN THE WATERS OF THE BUKK AND ZEMPLENI MOUNTAINS: I, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.
J. Szabo, G. Devai, I. Devai, K. Horvath, and I. Bancsi.
Acta Biol Debrecina. 7/8, p 223-243, 1969/70.

Descriptors: *Dissolved oxygen, *Ecological distribution, *Hungary, Mountains, Decomposition, Indicators, Springs, Streams, Bioindicators.

Comprehensive investigations in Hungary of the factors influencing the dissolved O2 content is spring and creek water show the dissolved O2 level in spring-water is primarily determined by the extent of the water-air contact and by the tem-

perature. The O2 saturation of water-rich karst springs with high dissolved O2 level is fairly constant throughout the year. The dissolved O2 content of creek water is fairly uniform, and its variations are largely a function of the water yield. Living organisms constitute a major factor regarding the dissolved O2 content in spring and even in quick-running creek water. Decreased O2 saturation during summer as compared with colder periods indicates intensified decomposition processes while O2 saturation values in summer equal to or slightly higher than those in winter indicate the predominance of photosynthesizing organisms.--Copyright 1973, Biological Abstracts, Inc.
W78-04595

A MODEL FOR THE SIMULATION OF RAIN-WATER RUNOFF IN SEWERS (EIN MODELL ZUR SIMULATION DES REGENABFLUSSES IN KANALISATIONSNETZEN),
Balzari Blaser Schudel, Ingenieure und Planer, Bern (Switzerland).
P. Kaufmann.
Gas-Wasser-Abwasser, Vol. 57, No. 3, p 287-292, 1977. 14 fig, 1 tab.

Descriptors: *Computer models, *Pipes, *Storm runoff, *Analytical techniques, *Model studies, Mathematical models, Sewers, Sewerage, Waste water treatment.

An electronic program has been developed for the hydraulic analysis of drain pipes. ELCAN precisely simulates flow conditions in a sewer system, taking into consideration backwash, retention, and pipe or trunk pressure in the network. This type of calculation for sewer networks allows optimum use of existing pipelines, while minimizing unwarranted investments so that sewer construction will answer actual needs. A series of tests used in evaluating the model and its sensitivity is presented along with some examples of possible practical applications. (Blits-FIRL)
W78-04627

THE MODELING OF ACTIVATED CARBON ADSORBERS IN THE PRESENCE OF BIO-OXIDATION,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 5D.
W78-04628

A PHYSICAL AND MATHEMATICAL MODEL OF MASS TRANSFER AND REACTION KINETICS OF OZONATION,
Anderson-Nichols and Co., Boston, MA.
For primary bibliographic entry see Field 5D.
W78-04629

EFFECTS OF EXTERNAL MASS TRANSFER AND INTRAPARTICLE DIFFUSION ON ADSORPTION RATES IN SLURRY REACTORS,
Williams and Works, Grand Rapids, MI.
For primary bibliographic entry see Field 5D.
W78-04631

EVALUATION OF THE POLLUTION AND DROUGHT HYPOTHESES IN RELATION TO LICHENS AND BRYOPHYTES IN URBAN ENVIRONMENTS,
Ottawa Univ. (Ontario). Dept. of Biology.
F. Leblanc, and D. N. Rao.
Bryologist. 76(1), p 1-19, 1973.

Descriptors: *Bryophytes, *Drought, Environments(Urban), *Lichens, *Water pollution, Domestic water, *Cities.

The evidence on the pollution and drought hypotheses, which seek to explain the rarity of lichens and bryophytes in urban environments, have been critically examined. It is concluded that the premises and logic of the drought hypothesis are not acceptable. In the present paper the importance of experimentation and of phytosociological quantification in ecological hypotheses are stressed.--Copyright 1973, Biological Abstracts, Inc.
W78-04635

ALTERATION OF CRUDE OIL BY WATERS AND BACTERIA: EVIDENCE FROM GEOCHEMICAL AND ISOTOPE STUDIES,
Imperial Oil Ltd., Calgary (Alberta).
N. J. L. Bailey, H. R. Krouse, C. R. Evans, and M. A. Rogers.
Am Assoc Pet Geol Bull. 57(7), p 1276-1290, 1973.

Descriptors: *Bacteria, Canada, *Crude oil alteration, *Geochemical studies, *Isotope studies, *Oxidation, Reservoirs, Washing, *Biodegradation, Water pollution.

Oils from the Mississippian Mission Canyon 5 (MC5) carbonates of Saskatchewan (Canada), on the northern flank of the Williston basin, were changed from sweet, medium- to high-gravity crudes, to sour nonproducible tars where the MC5 subcrop trend is intersected by a zone of fresh meteoric formation water. These waters are recognized by lower salinities and oxygen isotopic compositions which resemble water from present-day precipitation. The alteration of petroleum by fresh water may involve 3 processes: inorganic oxidation, water washing, and biodegradation. Inorganic oxidation (oy O2) is restricted largely to nearsurface reservoirs and is not documented by the present study of crudes from depths of 35000-6000 ft. Water washing occurred where formation waters undersaturated with hydrocarbons dissolved the more soluble lighter hydrocarbons in the reservoired oils. This left more sulfurous, heavier crudes with lower solution gas-oil ratios. Bacterial degradation occurred within the area of freshwater invasion, presumably through the introduction of microorganisms, O2, and nutrients. Normal paraffins and smaller naphthenes were preferentially degraded and nonhydrocarbon NSO compounds and asphaltenes produced with resulting low-wax, heavier, more sulfurous crudes. Isotope data provide additional evidence of bacterial activity in the subsurface. In the study area, water washing and biodegradation reduced crude oil gravities by more than 20 degrees API and increased the S content from less than 1% to more than 3%.--Copyright 1974, Biological Abstracts, Inc.
W78-04649

TRANSPORT OF HEAVY METALS IN A SLUDGE-TREATED FORESTED AREA,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
R. C. Sidle, and L. T. Kardos.
Journal of Environmental Quality, Vol 6, No 4, p 431-437, October-December, 1977. 10 tab, 16 ref.

Descriptors: *Pollutant identification, *Percolating water, *Heavy metals, *Soil amendments, *Soil contamination, Soil analysis, Sewage sludge, Sludge disposal, Cadmium, Zinc, Copper, Chromium, Lead, Cobalt, Nickel.

The transport of selected heavy metals in a forested sludge disposal area was evaluated with respect to the distribution of metals in the extractable and total fractions of the soil and in the soil water percolate. Anaerobically digested sludge was applied to plots in a hardwood forest at rates of 12.71 and 26.96 metric tons of sludge solids/ha. Cu, Zu, and Cd loadings at the higher application rate were 24.50, 28.49, and 0.253 kg/ha., respectively. Percolate quantities of Cu, Zn, and Cd leaving the 120 cm soil depth at the high treatment rate were 0.3, 3.2, and 6.6% of the applied levels, respectively. The relative order of mobility in the soil was determined as Cd>Zn>Cu. Measurements of the 0.1N HCL extractable and total soil fractions of Cu, Zn, and Cd in samples collected before and after sludge application indicated that the relative order of extractibility was Cu>Zn>Cd. Analyses of Cr, Pb, Co, and Ni in 0.1N HCL soil extracts revealed an increase in the Cr and Ni concentration at the 0-7.5 cm depth as a result of sludge application. (Snyder-FIRL)
W78-04653

METHOD DEVELOPMENT AND MONITORING OF POLYNUCLEAR AROMATIC HYDROCARBONS IN SELECTED U.S. WATERS,
Syracuse Research Corp., NY.
For primary bibliographic entry see Field 5A.
W78-04656

MOVEMENT OF MERCURY-203 IN PLANTS,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
D. D. Gay, and G. P. Butler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 472, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/3-77-122, October 1977. 13 p, 2 fig, 2 tab, 47 ref. IAA602.

Descriptors: *Plant physiology, *Biochemistry, *Mercury-203, Trace elements, Legumes, Absorption, Biological uptake, Metabolism, Storage, Pollutants, Radioisotopes, *Plant chemistry, Methyl mercury, Phenyl mercury, Transformation, Pisum sativum.

This study was designed to assess plant uptake, translocation, and storage of three forms of mercury via root uptake from contaminated soil. Radioactive mercury-203, in the forms of mercuric acetate, methylmercuric chloride, and phenylmercuric acetate, were used. Two distinct varieties of the garden pea Pisum sativum were used, a dwarf variety, Little Marvel, and a normal variety, Alaska. The seeds were planted in soils contaminated with the mercury compounds. After maturation, stems, leaves, and pods were harvested and analyzed by gamma spectroscopy. Utilizing a least squares three-way analysis of covariance coupled with a Studentized Range Test, significant differences were noted among the levels of the three mercury compounds in the plants, between mercury levels in the two pea varieties, and among mercury levels in the different pea tissues examined. Phenylmercury levels differed consistently from levels of ionic mercury and methylmercury, suggesting a separate pathway for it in peas with regard to metabolism and storage. (Wares-IPA)
W78-04658

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON NITROSAMINES.
Environmental Protection Agency, Research Triangle Park, NC. Office of Research and Development.
For primary bibliographic entry see Field 5C.
W78-04659

FUSION METHOD FOR THE MEASUREMENT OF PLUTONIUM IN SOIL: SINGLE-LABORATORY EVALUATION OF INTERLABORATORY COLLABORATIVE TEST,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-04660

EVIDENCE FOR PARTIAL DEGRADATION OF TOXAPHENE IN THE AQUATIC ENVIRONMENT,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
G. F. Lee, R. A. Hughes, and G. D. Veith.
Water, Air, and Soil Pollution, Vol. 8, No. 4, October 1977, p 479-484, 1 fig, 9 ref.

Descriptors: Environmental effects, *Water pollution sources, Toxicity, *Pesticides, Fish control agents, Aquatic environment, Sediments, *Degradation(Decomposition), *Pesticide residues, Detoxification, *Toxaphene.

Toxaphene which was present in lake sediments from a previous rough fish control program was extracted and used in a fish bioassay study. Bioassays showed that the toxicity of the toxaphene was reduced compared to the toxicity of the original formulation which had been added to the lake 10 months before. It was concluded that commercial toxaphene formulation is somewhat detoxified in the aquatic environment. (Chilton-ORNL)
W78-04674

THE INTERACTION OF DDT WITH SUSPENDED PARTICLES IN SEA WATER,
Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
N. Picer, M. Picer, and P. Strohal.
Water, Air, and Soil Pollution, Vol 8, 1977, p 429-440, 10 fig, 1 tab, 19 ref.

Descriptors: *Water pollution sources, *Path of pollutants, Pesticides, *DDT, *Sea water, Suspension, Adsorption, Pesticide residues.

Radiotracer techniques were used to study the equilibrium distribution of DDT between the liquid and solid phases in sea water. The adsorption of DDT on suspended solids as a function of concentration is presented as adsorption isotherms. It was concluded that DDT in these experiments did not exist in seawater as a real seawater solution but as a kind of colloid aggregate and that for evaluation of the real fate of DDT in the marine environment, adsorption and desorption experiments would have to be performed at concentration of 10 to 50 ppt (lower than in these experiments).)Chilton-ONRL)
W78-04676

AQUEOUS RELEASE OF HEAVY METALS FROM TWO SEWAGE SLUDGES,
Agricultural Research Service, Morgantown, WV. Plant Sciences Div.
R. C. Sidle, and L. T. Kardos.
Water, Air, and Soil Pollution, Vol. 8, 1977, p 453-459, 3 tab, 12 ref.

Descriptors: Environmental effects, Pollution, *Groundwater, Sewage, *Sewage sludge, *Heavy metals, Copper, Zinc, Cadmium, Soil water, Pollutant identification.

Two anerobically digested sewage sludges, one of relatively low and one of relatively low and one of relatively high heavy metal content, were extracted several times with water. It was found that relatively small amounts (1 - 7%) of the total Cu, Zn, and Cd in the two sludges would be readily available for transport in soil water immediately following the application of these sludges to the land. The percentage of non-cationic species of each of these metals in the aqueous extract, which represents the most mobile component in soils, was different in the two sludges, ranging from <1% for Zn and Cd in one sludge to 56.2% for Cd in the other. It was suggested that fractionation into cationic and noncationic forms of the metals in aqueous sludge estracts may be a useful index of the groundwater pollution hazard of the sludge. (Chilton-ORNL)
W78-04677

THE USE OF NEAR-INFRARED REFLECTED SUNLIGHT FOR BIODEGRADABLE POLLUTION MONITORING,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04682

WATER QUALITY MONITORING IN SOME EASTERN EUROPEAN COUNTRIES,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5A.
W78-04688

REMOTE SENSING DATA, A BASIS FOR MONITORING SYSTEMS DESIGN,
Geological Survey, Iowa City, IA.
For primary bibliographic entry see Field 5A.
W78-04690

AIRCRAFT AND SATELLITE MONITORING OF LAKE SUPERIOR POLLUTION SOURCES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-04695

COMMENTS ON ENVIRONMENTAL MONITORING IN REGION VII AND SOME MONITORING PLANS AND NEEDS PREPARED FOR SECOND CONFERENCE ON ENVIRONMENTAL SENSORS,
Environmental Protection Agency, Kansas City, MO. Region VII.
For primary bibliographic entry see Field 5A.
W78-04699

5C. Effects Of Pollution

RESERVOIR METALIMNION OXYGEN DEMANDS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04202

AGRICULTURAL CHEMICALS IN THE ENVIRONMENT (AGROCHEMIKALIEN IN DER UMWELT),
VEB Gustav Fischer Verlag, Jena (East Germany).
E. Henisch, H. Paucke, H.-D. Nagel, and D. Hansen.
1976, 306 p.

Descriptors: *Agricultural chemicals, *Chemical wastes, Environment, *Pesticides, Soil treatment, *Fertilizers, Air pollution, Toxicity, Pesticide residues, Soils.

The levels of agricultural chemicals (pesticides, chemicals applied to soil) and their derivatives in soil, water and air and their effect on aquatic life and birds are discussed. Chapters on mineral and organic fertilizer for plants, biological control of plant pests, toxicology of pesticides and contamination of fodder are included.—Copyright 1978, Biological Abstracts, Inc.
W78-04207

THE CYCLICITY OF THE PROCESS OF CHANGES IN THE BIOMASS OF LAKE BAIKAL ZOOPLANKTON OVER MANY YEARS, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Univ. (USSR). Scientific Research Inst. of Biology.
O. M. Kozhova, and N. G. Melnik.
Gidrobiol Zh 13(1), p 36-39, 1977.

Descriptors: *Zooplankton, *Biomass, *Lake Baikal(USSR), Lakes, Cycling nutrients, Water pollution, Cladocera, Copepoda, Rotatoria.

Visual analysis of chronological graphs indicates a cyclic character in the variations of zooplankton biomass over several years in Lake Baikal, USSR. Copepoda, Cladocera and Rotatoria are examined in detail. Copepoda has a 14 yr. Biomass cycle whereas Rotatoria and Cladocera both have 15 yr duration cycles.--Copyright 1978, Biological Abstracts, Inc.
W78-04212

THE EFFECT OF DETERGENT 'SOLO' AND CRUDE OIL ON THE ACTIVITIES OF CATHEPSIN D AND ACID PHOSPHATASE IN HEMOLYMPH OF CRANGON CRANGON L.,
Medical Academy, Gdansk (Poland). Dept. of Biology.
G. Drewa, Z. Zbytniewski, and F. Pautsch.
Polskie Archiwum Hydrobiologii, Vol. 24, No. 2, 1977, p 279-284, 4 fig, 16 ref.

Descriptors: Environmental effects, *Water pollution effects, Biochemistry, *Shrimps, Pollutants, *Detergents, Oil, *Oil pollution, Cathepsin D, Acid phosphatase, Hemolymph, Crangon crangon L.

Investigation showed that the hemolymph cathepsin D activity in shrimps exposed in detergent concentrations of 10, 50 and 100 mg/l increased but that the activity dropped below the control values of shrimps exposed in water with an addition of crude oil. Acid phosphatase activity decreased at all concentrations of the detergent and crude oil after 12 and 24 hrs, but rose slightly after 48 hours without attaining control levels. These disturbances in activities of cathepsin D and acid phosphatase are attributed to changes in the permeability of the lysomal membranes. (Chilton-ORNL)
W78-04237

NITROGEN CHANGES IN STARVED EEL (ANGUILLA ANGUILLA L.),
Polish Academy of Sciences, Warsaw. Lab. of Ecological Bioenergetics.
Z. Fischer.
Polskie Archiwum Hydrobiologii, Vol. 24, No. 2, 1977, p 289-298, 4 fig, 3 tab, 23 ref.

Descriptors: Environmental effects, *Eels, *Metabolism, Weight, *Nitrogen, *Starvation, Protein metabolism, Lipid metabolism.

Nitrogen excretion, respiration and loss of weight of eels subjected to long-lasting starvation (460 days) was examined. In the course of the starvation period a limitation of mobility to the minimum and transition into resting metabolism were observed. Losses of weight during the first year of starvation were equalized and amounted to less than 0.2% of the body weight per day. In the course of the extension of the starvation period up to 460 days the daily losses of weight increased up to about 0.3%. Protein metabolism constituted 30% of total metabolism and the remainder of the energy was taken by the organism by the breaking down of lipids. (Chilton-ORNL)
W78-04238

SEASONAL DISTRIBUTION AND ABUNDANCE OF FISHES IN THE LITTORAL ZONE OF A MICHIGAN LAKE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station; and Michigan State Univ., Hickory Corners. Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W78-04240

TRACE METAL CONTAMINATION OF BLUEGILL (LEPOMIS MACROCHIRUS) FROM TWO INDIANA LAKES,
Prudue Univ., Lafayette, IN. Dept. of Bionucleonics.
G. J. Atchison, B. R. Murphy, W. E. Bishop, A. W. McIntosh, and R. A. Mayes.
Transactions of the American Fisheries Society, Vol 106, No 6, 1977, p 637-640, 1 fig, 2 tab, 17 ref.

Descriptors: Environmental effects, *Water pollution, *Heavy metals, Fish, *Indiana, *Lakes, Cadmium, Zinc, Lead, Industrial wastes, *Trace elements, *Bluegill.

The two lakes, Little Center Lake and Palestine Lake, from which bluegill were collected are both contaminated by industrial discharges. Bluegill were also collected from several uncontaminated sites to determine background levels of the metals. Metal concentrations (per dry weight) in the bluegill ranged from high levels of 15 microg Cd/g, 42 microg Pb/g, and 480 microg Zn/g to low levels of nondetectable amounts of Cd and Pb and 86 microg Zn/g. Mean concentrations of Cd and Zn were highest in bluegill from Palestine Lake and mean concentrations of Pb were highest in bluegill from Little Center Lake. All mean concentrations were higher than in background. (Chilton-ORNL)
W78-04243

HEALTH IMPLICATIONS OF WATER CONTAMINANTS IN MAN,
National Cancer Inst., Bethesda, MD.
R. W. Miller.
Annals of the New York Academy of Sciences, Vol. 298, p 557-560, September, 1977. 17 ref.

Descriptors: *Carcinogens, *Pollutants, Water supply, Potable water, Methylmercury, Organic compounds, Diseases, Cancer.

Considering the vase array of serious effects of water pollution that have been observed in humans, one could question the necessity of invoking the specter of cancer in order to achieve clean water. The possibility that various drinking water contaminants may be carcinogenic is undeniable, yet, there is no evidence that ingestion of low levels of these chemicals actually causes cancer. The multiplicity of variables involved in the analysis of both polluted drinking water and mixture of diseases known as 'cancer' in humans pose formidable difficulties to researchers. Ideally, prevention can ultimately be achieved through studies that reveal the mechanisms of carcinogens. Once these are known, preventive measures will likely become available. In the meantime, it is hoped that laboratory screening procedures which are highly correlated with known carcinogens can be used to indicate other chemicals which pose real dangers. (Eberle-NWWA)
W78-04302

THE INTERNATIONAL COOPERATION IN STUDYING THE HEALTH ASPECTS OF ORGANIC CONTAMINANTS IN INDIRECTLY REUSED WASTE WATER,
International Reference Center for Community Water Supply, Leidschendam (Netherlands).
For primary bibliographic entry see Field 5D.
W78-04305

RELATIONSHIPS BETWEEN WATER CHEMISTRY AND PRIMARY PRODUCTS IN STREAMS, A LIMNOLOGIC PROBLEM, (IN GERMAN),
Zurich Univ. (Switzerland). Inst. fuer Pflanzenbiologie.
E. A. Thomas, and F. Schanz.
Vierteljahrsschr Naturforsch Ges Zuer 121(4), p 309-318, 1976.

Descriptors: Algae, Macrophytes, Management, Phosphate, Sewage, *Water chemistry, Limnology, *Primary productivity.

The primary products (phytomass) in small streams are estimated. These data are correlated with the water chemistry and limnologic activities of small streams. Whether the introduction of the elimination of phosphates in water treatment plants (3rd treatment stage) would possibly reduce the excessive growth of algae and weed (macrophytes) in small sewage loaded streams is also discussed. The varying phytomass levels of comparable small streams have been defined in a chematic figure. The method can also be used as basis for forming an estimate of the algal mass of shallow lake shore waters.--Copyright 1978, Biological Abstracts, Inc.
W78-04339

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO. 4, THE PRODUCTION, USE AND DISTRIBUTION OF PHTHALIC ACID ESTERS IN CANADA,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-04348

HEATED DISCHARGE CONTROL AND MANAGEMENT ALTERNATIVES SMALL WATER BODIES AND RIVERS.
MacLaren (James F.) Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5D.
W78-04353

THE EUTROPHIC POTENTIAL OF WAHIAWA RESERVOIR SEDIMENTS,
Hawaii Univ., Honolulu. Water Resources Research Center.
L. W. K. Lum, and R. H. F. Young.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 698, Price codes: A07 in paper copy, A01 in microfiche. Technical Report No. 103, August 1976. 121 p, 47 fig, 41 tab, 50 ref, append. OWRT A-066-HI(1), 14-34-0001-6012.

Descriptors: *Eutrophication, *Sediments, *Sewage effluents, Nitrogen, Phosphorus, *Hawaii, Lakes, Reservoirs, Water pollution sources, Water pollution effects, *Wahiawa Reservoir, Lake Wilson, Wahiawa Sewage Treatment Plant, Oahu(Hawaii).

Secondarily-treated sewage effluent discharges into the Wahiawa Reservoir have been implicated as the primary cause of the eutrophic conditions present in the reservoir. The relative importance of in situ nutrient sources, such as N fixation and the sediment, have not, however, been determined. Assessment of the eutrophication potential of the sediment and its relative importance and impact on the selection of a management alternative was the objective of this study using laboratory sediment-water contact systems. Sediment was incubated with four different types of water simulating aerobic and anaerobic conditions in the hypolimnion of the Wahiawa Reservoir. Samples were withdrawn periodically and analyzed for nutrients, chemical oxygen demand (COD), and other constituents. After parameters reached a steady-state, the algal growth potential (AGP) of the waters was determined. Under aerobic conditions, the sediment tended to have an oligotrophic effect on the water. Phosphorus was adsorbed by the sediment, N release from the sediment was inhibited by the development of a surface-oxidized layer, and the COD of the water was decreased. This effect was verified by the poor AGP of the water, which was P deficient. Sediments were able to cause or maintain eutrophic conditions in the test reactors under anaerobic conditions due to release principally of N as NH3. However, the nutrient contribution was of minor importance, only 18% of the N and less than 1% of the P loading to the reservoir relative to other sources. Corrective measures with respect to nutrients released from the sediment are not required, but stabilization of the O2 demand from substances released from the sediment (about 10 mg/l COD) may be required to improve dissolved O2 levels in the deeper portions of the reservoir. A nutrient model of the reservoir shows that diversion of the Wahiawa Sewage Treatment Plant effluent will result in a 65% reduction of N and a 46% reduction of P in the epilimnion of the reservoir. New steady-state conditions are expected to be attained within 30 days, while new steady-state conditions for the hypolimnion and sediments may require about two years.
W78-04366

METHANE IN LAKE ERIE: ANALYSIS OF MECHANISMS OF PRODUCTION AND OF AMOUNTS PRODUCED,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-04373

THE CHEMICAL CONDITIONS OF THE WATER IN LAKE KAVSJON, (IN SWEDISH),
Lund Univ. (Sweden). Limnological Inst.
S. Hamrin.
Fauna Flora (Stockh) 71(6), p 254-260, 1976.

Descriptors: Fish kills, *Lake Kavsjon(Sweden), Shallow lakes, Oxygen content(Water), Lakes.

The water in Lake Kavsjon (Sweden) is often low in 0z, probably because the lake is shallow 9 mean depth 0.7 m, maximum depth 1.2 m). During the ice-free period the water is characterized by high values of pH color, carbonate, K, P and Fe. Fish kills are frequent during the winters due to the low 0z content which appear to be due to the inflow from a stream draining a small humus-rich lake. In cold winters the 0z content drops to 0% with the resultant decimation of fish and other organisms.--Copyright 1978, Biological Abstracts, Inc.
W78-04434

PROCESSING LAKES WITH DAMAGED ECOSYSTEMS (IN GERMAN),
Lund Univ. (Sweden). Limnological Inst.
W. Ripl.
Vierteljahrsschr Naturforsch Ges Zuer 121(4), p 303-308, 1976.

Descriptors: Chemical wastes, Chironomids, Duckweed, Leuciscus-Rutilus, Macrophytes, Nitella, Sediments, Sweden(Varnamo), *Ecosystems, *Lakes.

An example of intervention in a lake ecosystem is described for Lillesee, 7 km west of the southern Swedish City of Varnamo, where the use by the local population has added about 300 kg of phosphates/yr for 15 yr. A macrophyte population covered about 40% of the lake surface, and there was an annual summer addition of 90 tons of organic material. A mechanical system for introducting chemicals into the lake was developed; this was operated about 4-5 h/day, adding 146 g Fe, 180 g of Ca (as Ca(OH)z) and 141 g N as calcium nitrate/m2. After this treatment the duckweed no longer developed. Subsequently the macrophytes were removed, roots and all. The littoral was colonized with Nitella, and there was a rapid increase in the red eye (Leuciscus rutilus) fish population. The treated sediment was quickly populated by chironomids.--Copyright 1978, Biological Abstracts, Inc.
W78-04436

VARIATIONS IN THE LEVELS OF MINERAL AND ORGANIC MATERIALS CARRIED BY A CANALIZED RIVER, THE LOT, (IN FRENCH),
Toulouse-3 Univ. (France). Lab. d'Hydrobiologie.
H. Decamps, J. C. Massio, and J. C. Darcos.
Ann Limnol 12(3), p 215-238, 1976.

Descriptors: Algae, Chlorophyll, Electric powerplants, Human wastes, Industrial wastes, *Mineralization, Model, Multiple, Organic matter, Regression analysis, *Seasonal, *Temperature, *Turbidity, Canalized river, *France.

The operation of dams in the upper reaches of the Lot (France) and its Truyere tributary affects the water quality of the middle and lower reaches of

the river where the Lot is canalized. These effects were analyzed with the help of a mathematical model of discharge and the model was used to determine the origins of different masses of water circulating in the 235 km section of canalized river. Profiles taken down the river at different times of the year were used to determine the major changes in the levels of mineral matter, organic matter, dissolved and particulate matter, all carried in suspension in the water. The most important factors, in order of decreasing importance, are the time of the year (seasonal factor), the turbidity of the water and the mineralization of the water. Seasonal changes are chiefly due to water temperature which was the principal factor responsible for variation in chlorophyll a in a multple regression model. This temperature effect is enhanced by the decreased flows at low water levels due to the use of the river in summer for hydro electric purposes. The turbidity of the water is closely associated with the presence of mineral matter. The most important and long lasting effects in the lower reaches are due to the floods of the Dourdou, a tributary draining the sandstone terrain of the Permo-trias. The algae increases the turbidity chiefly in the form of inert organic material mixed with mineral matter. The water coming from the Truyere has a lower mineral content and is less favorable than the upper Lot for the development of algae. The positive correlation between conductivity and temperature shows the importance of urban and industrial waste materials during the low water levels of the summer.-Copyright 1978, Biological Abstracts, Inc.
W78-04441

THE PHYSIOLOGICAL EFFECTS OF ACUTE AND CHRONIC EXPOSURE TO HYDROCARBONS ON NEAR-SHORE FISHES OF THE BERING SEA,
Scripps Institution of Oceanography, La Jolla, CA. Physiological Research Lab.
A. L. Devries.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 1-22, March 1977. 2 fig, 4 tab, 12 ref. 03-5-022-86.

Descriptors: *Fishes, *Water pollution effects, *Baseline studies, *Aromatic compounds, Biochemistry, Oil pollution, Alaska, *Outer Continental Shelf, *Hydrocarbons, Bering Sea, Petroleum, Near-shore fishes, Chronic exposure, Sublethal effects, Naththalene, Physiological ecology.

The main objective was to establish the effect of selected petroleum hydrocarbons on the physiology of certain cold-water fishes that are year round residents of the Bering Sea. Sculpins from the Bering Sea were shown to take up naphthalene from their environment, however it appeared to have little effect on the biosynthesis of either the plasma protein or of the peptide antifreeze. Morphological studies demonstrated that naphthalene exposure caused deterioration of the liver, however it was not determined whether this was a direct effect of naphthalene metabolism or resulted indirectly from anemia and reduced food intake. The normal rate of protein synthesis in the naphthalene exposed fishes suggests that compensatory mechanisms exist to maintain a constant synthetic rate of liver proteins. (Sinha - OEIS)
W78-04443

LETHAL AND SUBLETHAL EFFECTS ON SELECTED ALASKAN MARINE SPECIES AFTER ACUTE AND LONG-TERM EXPOSURE TO OIL AND OIL COMPONENTS,
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
S. D. Rice, S. Korn, and J. F. Karinen.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 23-43, March 1977. 5 ref. R7120822.

Descriptors: *Toxicity, *Water pollution effects, *Alaska, Mortality, Shellfish, Oil pollution, *Outer Continental Shelf, Sublethal effects.

Laboratory and field studies were conducted to determine recovery rates of selected organisms and ecosystems from perturbations resulting from either contamination or other disturbances associated with petroleum development. The research involved physiological and bioassay tests of applied research on species indigenous to the Gulf of Alaska, Bering Sea, and Beaufort Sea. The major emphasis of research has shifted from strictly descriptive acute toxicity determinations to mechanistic studies and sublethal tests that will eventually allow prediction of oil impact on the biota. Studies to determine the acute toxicity of the water-soluble fraction (WSF) of crude oil continue with experiments with species not tested previously. Methodology and apparatus of flow-throgh tests have been designed and three systems are in use. Experiments also continue with larvae of species not tested previously. Emphasis is on intertidal species, such as mussels, barnacles, snails, and sea urchins. (Sinha - OEIS)
W78-04444

THE RELATIVE IMPORTANCE OF EVAPORATION AND BIODEGRADATION, AND THE EFFECT OF LOWER TEMPERATURE ON THE LOSS OF SOME MONONUCLEAR AND DINUCLEAR AROMATIC HYDROCARBONS FROM SEAWATER,
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
D. L. Cheatham, R. S. McMahon, S. J. Way, and J. W. Short.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 44-65, March 1977. 13 ref.

Descriptors: *Toxicity, *Water pollution effects, *Baseline studies, *Evaporation, *Biodegradation, Alaska, Oil pollution, Temperature, *Outer Continental Shelf, Cook Inlet(AK), Aromatic hydrocarbons.

A Cook Inlet crude oil water-soluble fraction, incubated at 5 degrees, 8 degrees, and 12 degrees C. was analyzed by gas chromatography during a 96-h period to determine the effect of temperature on evaporation and biodegradation of individual mononuclear and dinuclear aromatic hydrocarbons in seawater. The relative importance of evaporation and biodegradation on the loss of these hydrocarbons was assessed at each temperature using combinations of aeration and poison as experimental conditions. Lower temperature reduced the loss of mononuclear and dinuclear aromatic hydrocarbons from seawater. Evaporation was an especially significant factor in the loss of mononuclear aromatics. Biodegradation had little effect on mononuclear aromatics but had a significant effect on dinuclear aromatics, particularly naphthalene. Natural means exist for eliminating toxic aromatic hydrocarbons from seawater, even at low temperature. However, oil and seawater mixtures could be more toxic for longer periods of time at lower temperatures because aromatic hydrocarbons would persist in seawater longer. (Sinha - OEIS)
W78-04445

EFFECTS OF LOW TEMPERATURE ON THE SURVIVAL OF PINK SALMON AND SHRIMP EXPOSED TO TOLUENE, NAPHTHALENE, AND THE WATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL,
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
S. Korn, D. A. Moles, and S. D. Rice.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 66-84, March 1977. 4 tab, 13 ref.

Descriptors: *Toxicity, *Water pollution effects, *Temperature, *Baseline studies, *Oil pollution, *Alaska, Shrimp, Salmon, Cold regions, Subarctic, Arctic, *Outer Continental Shelf, Crude oil, Toluene, Naphthalene, Pandalus goniurus, Oncorhynchus gorbuscha.

Toxicity tests were conducted at different temperatures to determine the effects of temperature on survival of shrimp and fish exposed to oil and oil component solutions. Exposure concentrations declined with time, and at different rates for each temperature, simulating a point source spill in the environment. Shrimp (Pandalus goniurus and Eualus spp.) and pink salmon (Oncorhynchus gorbuscha) were tested (96-h bioassays) with toluene, naphthalene, and the water-soluble fraction (WSF) of Cook Inlet crude oil at 4 degrees, 8 degrees and 12 degrees C. Median tolerance limits (96-h TLm) were computed by probit statistics. Oil concentrations were measured by ultraviolet spectrophotometry. The effect of different temperatures on the toxicity of toluene, naphthalene, and the WSF of Cook Inlet crude oil solutions depended on species and toxicant. Survival of shrimp exposed to toluene and naphthalene was significantly less at higher temperatures. In contrast, survival of pink salmon exposed to toluene was significantly less at lower temperatures. Other tests did not yield significant temperature effects. (Sinha - OEIS)
W78-04446

EFFECTS OF COOK INLET CRUDE OIL, BENZENE, AND NAPHTHALENE ON HEART RATES OF THE ALASKAN KING CRAB (PARALITHODES CAMTSCHATICA),
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
T. A. Mecklenburg, and S. D. Rice.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 85-125, March 1977. 5 fig, 1 tab, 13 ref.

Descriptors: *Water pollution effects, *Baseline studies, *Aromatic compounds, *Pathology, Crabs, Cold regions, Alaska, Oil pollution, *Outer Continental Shelf, Sublethal effects, Crude oil, Benzene, Naphthalene, Paralithodes camtschatica.

Continuous monitoring of heart rates during exposure to toxicants was found to be a sensitive indicator of sublethal responses in the king crab, Paralithodes camtschatica. In exposures to water-soluble fractions of Cook Inlet crude oil, benzene, and naphthalene, the heart rate response was consistently one of depression, followed by return to normal as the crude oil or aromatic concentrations in the seawater declined. In one of the experiments with crude oil, respiration was also monitored; it closely parralleled the changes in heart rate. In another, using periodically repenished crude oil water-soluble fractions, the heart rate remained depressed until the oil concentration was allowed to drop. Benzene produced more severe and longer-lasting heart rate depressions than did naphthalene or crude oil; the response of benzene also occurred much sooner after initial exposure. The long-lasting sublethal effect of benzene was evident even though the benzene degraded more rapidly in the water than either crude oil or naphthalene. All of the experiments substantiated a strong relationship between oil or aromatic fraction degradation and heart rate recovery. (Sinha - OEIS)
W78-04447

SUBLETHAL EFFECTS OF PETROLEUM HYDROCARBONS AND TRACE METALS, INCLUDING BIOTRANSFORMATIONS, AS REFLECTED BY MORPHOLOGICAL, CHEMICAL, PHYSIOLOGICAL PATHOLOGICAL, AND BEHAVIORAL INDICES,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.

D. C. Malins, E. H. Gruger, Jr, H. O. Hodgins, and D. Weber.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 125-298, March 1977. 38 fig, 31 tab, 148 ref. R7120820.

Descriptors: *Water pollution effects, *Baseline studies, *Alaska, *Oil pollution, Trace metals, Salmon, Shrimp, Arctic, Subarctic, *Outer Continental Shelf, *Sublethal effects, Biotransformations, Hydrocarbons, Petroleum hydrocarbons, Oncorhynchus, Pandalus.

Several findings have implications with respect to petroleum effects on aquatic species and consequently to OCS oil and gas development. Most of the studies were designed as laboratory experiments and the degree to which laboratory results can be directly applied to natural events remains a considerable problem. The observed susceptibility of postlarval and adult shrimp to very low levels of naphthalene in seawater strongly suggest that petroleum introduced into the environment of these and related animals would have substantially deleterious effects. Similarly, the observed structural changes in salmonid fish after hydrocarbon exposure, and the uptake and retention of toxic trace metals by salmon and flatfish imply that the presence of petroleum and trace metals at some concentrations in diet, water, or sediment would be harmful to these species. Controlled field studies on salmon homing indicated that low concentrations of hydrocarbons do not affect salmon homing behavior or ability and thus imply that petroleum hydrocarbons in the path of migrating salmon would not completely disrupt their migration. The fact that greater accumulations of hydrocarbons were found in exposed fish at 4 degrees C, as compared to 10 degrees C, suggests that cold water environments may substantially increase the hydrocarbon burden under Arctic conditions in comparison to temperate regions. (Sinha - OEIS)
W78-04448

ECOSYSTEMS DYNAMICS, EASTERN BERING SEA,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
T. Laevastu, and F. Favorite.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 299-341, March 1977. 16 fig. R7120810.

Descriptors: *Water pollution effects, *Models, *Mathematical models, *Ecosystems, Alaska, Bering Sea, Oil pollution, Baseline studies, *Outer Continental Shelf.

The nature, size, complexity and feasibility of a multi-component, dynamic, numerical ecosystem model for the eastern Bering Sea was investigated and a functional model permitting useful and reliable assessment of fluctuations in the eastern Bering Sea biomass was constructed. A summary review of the Dynamical Numerical Marine Ecosystem (DYNUMES) Model is given and some specific components account for environmental effects are presented. The model uses the accumulated knowledge on marine ecology in direct form, and interactions can be quite different from one group of species and/or processes to another. Although logical results are obtained, these are new concepts. The DYNUMES model for the eastern Bering Sea has demonstrated its utility in quantitative simulation of processes in the total marine ecosystem and in assessment of the impacts of man's activity on the marine ecosystem and its components. (Sinha - OEIS)
W78-04449

ECOSYSTEM DYNAMICS BIRDS AND MARINE MAMMALS. PART I: PRELIMINARY RELATIONSHIPS IN THE BERING SEA,
National Marine Fisheries Service, Seattle WA. Northwest and Alaska Fisheries Center.
W. B. McAlister, and M. A. Perez.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 342-371, March 1977. 4 fig, 11 tab, 28 ref.

Descriptors: *Water pollution effects, *Ecosystems, *Mammals, Baseline studies, Oil pollution, Fish Alaska, *Outer Continental Shelf, Bering Sea, Pinnipeds, Trophodynamic relationships.

Studies reported in this paper represent the results of research to integrate and synthesize data into a conceptual submodel of the ecosystem describing trophodynamic relationships in the eastern Bering Sea including interactions among northern fur seals, other marine mammals, marine birds, and several species of fish. The amount of food consumed by fur seal and other pinnipeds has been estimated and compared with the amount of fish caught by commercial fisheries in the same waters. Pinnipeds do consume a quantity of food consisting of both non -commercial and commercial fish stocks, especially pollock, which is nearly as great as that of the commercial fishery; although, the impact of fur seals is apparently not as great as that of other pinnipeds such as the northern sea lion. The impact of pinnipeds on the fishery is a complex interaction, and further analyses of data on the ecosystem and trophodynamic relationships of pinnipeds and finfish are required before the system can be understood. (Sinha - OEIS)
W78-04450

ECOSYSTEM DYNAMICS BIRDS AND MARINE MAMMALS. PART II: ASPECTS OF THE FEEDING ECOLOGY OF BERING SEA AVIFAUNA,
Fish and Wildlife Service, Anchorage, AK.
G. A. Sanger, and P. A. Baird.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 372-417, March 1977. 12 fig, 10 tab, 40 ref. No. 01-6-208-13424-NWAFC.

Descriptors: *Water pollution effects, *Ecology, *Birds, Oil pollution, Baseline studies, *Outer Continental Shelf, Bering Sea, Procellariidae, Laridae, Alcidae.

Dramatic seasonal changes occur in the abundance of birds in the eastern Bering Sea. Peak abundance occurs in early spring with the influx of Sooty and Short-tailed Shearwaters from their breeding grounds in the southern hemisphere, and with the staging of Alaskan breeding species prior to nesting. During the Alaskan birds' breeding season, the distribution of all species except the shearwaters is strongly oriented toward colonies. Little is known about the diets of the birds, but the abundant shearwaters and murres appear to consume large quantities of euphausiids, and schooling pelagic and demersal fishes. Prey items range in size from copepods of 7 mm or less to fish of at least 25 cm. Glaucous-winged Gulls, Black-legged Kittiwakes, and Northern Fulmars probably benefit greatly from offal produced by Walleye Pollock fisheries. The fisheries have possibly created an imbalance in the ecosystem which has benefited plantivorous birds. (Sinha - OEIS)
W78-04451

EFFECTS OF PETROLEUM EXPOSURE ON HATCHING SUCCESS AND INCUBATION BEHAVIOR OF GLAUCOUS-WINGED GULLS,
Johns Hopkins Univ., Baltimore, MD. Dept. of Pathobiology.
S. M. Patten, Jr., and L. R. Patten.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 418-445, March 1977. 13 fig, 11 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Birds, *Gulls, Alaska, Bird eggs, Hatching, *Outer Continental Shelf, Gulf of Alaska, Larus glaucescens.

An analysis of the effects of petroleum exposure on hatching success and chick survival of Alaskan Glaucous-winged Gulls (Larus glaucescens) is provided. The effects of both North Slope Crude Oil and mineral oil on the hatching success and incubation behavior of a key seabird species nesting on the Copper River Delta barrier islands is presented. Oil spill danger in the Copper River Delta barrier islands is high due to proximity to Valdez tanker lanes, offshore oil leases, counterclockwise onshore currents, strong tidal interchange, shallow slope of the islands, and huge concentrations of birds including the largest gull colonies in the northeast Gulf of Alaska. Research has been focused on Egg Island, where a control group and reproductive data are available from previous years. Egg oiling experiments had decided effects: North Slope Crude led to nearly complete mortality of all samples and high mortality with mineral oil applied to gull eggs. Hatching success was 14.6% compared to the normal range of 69-77% in the adjacent control colony. Oil application to egg surfaces causes not only high egg mortality, but the behavior of the adult birds is altered and they do not renest during the season due to extended periods of incubation. (Sinha - OEIS)
W78-04452

EVOLUTION, PATHOBIOLOGY AND BREEDING ECOLOGY OF THE GULF OF ALASKA HERRING GULL GROUP (LARUS ARGENTATUS X LARUS GLAUCESCENS),
Johns Hopkins Univ., Baltimore, MD. Dept. of Pathobiology.
S. M. Patten, Jr., and L. R. Patten.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 446-595, March 1977. 42 fig, 14 tab, 111 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Gulls, *Ecology, *Diseases, Domestic wastes, Wastes, Alaska, *Outer Continental Shelf, Gulf of Alaska, Larus argentatus, Larus glaucescens.

There are six known large gull colonies along the northeast Gulf of Alaska between Cordova and Juneau, in an area soon to be impacted by the development of oil resources. Information indicates these population have the potential for rapid increase with access to human garbage, sewage and refuse associated with increased oil operations, but their colonies are sensitive to disturbance during the breeding season. Gulls are associated with canneries, fish-packing houses, garbage dumps sewer outfalls and municipal water supplies along the coast of Alaska, and are clearly implicated with human bacterial and parasitic diseases in Alaska. As the availability of human generated refuse increases with the development of oil resources in the Gulf of Alaska, populations of gulls previously more isolated may come into closer contact with one another. The gene flow between gull populations in the Gulf of Alaska may be further increased in coming years as a secondary influence of human activities, which may lead to a new adaptive peak in this commensal bird species, with consequences for municipal health and sanitation. (Sinha - OEIS)
W78-04453

ACUTE EFFECTS - PACIFIC HERRING ROE IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Smith, and J. A. Cameron.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports

for the Year Ending March 1977, Vol 12. Effects, p 5961635, March 1977. 23 fig, 3 tab, 14 ref. 03-5--022-56.

Descriptors: *Water pollution effects, *Baseline studies, *Oil pollution, Fish, Herring, Hatching, Alaska, *Outer Continental Shelf, Hydrocarbons, Bering Sea, Gulf of Alaska, Clupea harengus pallasi.

The potential impact of OCS oil development activities on a single species of Alaskan marine fish, the Pacific herring (Clupea harengus pallasi) was evaluated. This project sought to simulate conditions of a crude oil spill to test the effects of low boiling point, water soluble hydrocarbon components of Prudhoe Bay crude on developing herring larvae. Exposure for as little as 48 hrs. led to a significantly higher incidence of gross morphological abnormalities. Exposure for six days resulted in 100% mortality in the fertilized embryos. The following conclusions were reached: the herring reproductive cycle is vulnerable to oil pollution for at least two months, possibly more; very low hydrocarbon levels produced significant effects in terms of hatching success, gross morphological abnormalities, total larval length, and presence of hydrocarbons in hatched larvae and unhatched embryos; and deliterious effects produced by oil contamination reduce the fitness of larvae which, at best, had little chance to survive to adulthood. (Sinha - OEIS)
W78-04454

SUBLETHAL EFFECTS ON SEAGRASS PHOTOSYNTHESIS,
Alaska Univ., College. Inst. of Marine Science.
C. P. McRoy, and S. L. Williams.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12, Effects, p 636-665, March 1977. 15 fig, 1 tab, 19 ref. 03-5-022-56.

Descriptors: *Water pollution effects, *Baseline studies, *Grasses, *Oil pollution, Photosynthesis, Alaska, *Outer Continental Shelf, *Sea grass, *Sublethal effects, Carbon uptake, Hydrocarbons, Zostera, Ruppia, Phyllospadix.

The sublethal effects of petroleum contamination on seagrass photosynthesis was examined. Kinetics of photosynthtic uptake of carbon were the primary basis of examination supplemented by field observations and experiments. It was found that the fundamental kinetic response of seagrass photosynthesis to light, as estimated by 14C uptake, was similar for three Alaskan species: Zostera, Ruppia, and Phyllospadix. Laboratory experiments of seagrass (Zostera) exposed to hydrocarbons exhibited productivity, as estimated by carbon uptake, reduced up to 2.2 times that of unexposed plants. Plants treated with tolulene were visibly affected at the end of a 5.5 hr exposure. The reduction of productivity of plants allowed a recovery period in clean seawater after exposure was not as severe. When exposed to hydrocarbons in natural situations such as in boat harbors or in situ experiments, plants showed no serious effects. In fact seagrasses are able to flourish in chronic low-level exposure. This result stongly discourages the use of laboratory experiments as the sole basis of extrapolation to management considerations. (Sinha - OEIS)
W78-04455

RESEARCH TO DETERMINE THE ACCUMULATION OF ORGANIC CONSTITUENTS, HEAVY METALS FROM PETROLEUM-IMPACTED SEDIMENTS BY MARINE DETRITIVORES OF THE ALASKAN OUTER CONTINENTAL SHELF,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
J. W. Anderson, G. Roesijadi, D. L. Woodruff, and E. A. Crecelius.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12, Effects, p 770-822, March 1977. 15 tab, 41 ref. 2311102778.

Descriptors: *Water pollution effects, *Baseline studies, *Oil pollution, *Sediments, Alaska, Benthos, Clams, Metals, *Outer Continental Shelf, Trace metals, Feeding habits, Petroleum hydrocarbons, Macoma inquinata, Phascolosoma agassizii.

Experiments were conducted to examine the bioavailability of petroleum hydrocarbons and trace metals from petroleum-impacted marine sediments. The feasibility of using bivalve condition index as an indicator of stress due to petroleum exposure was also tested. Prudhoe Bay Crude was the test oil in all experiments. When simultaneously exposed to oil in sediment for 40 days in the field, detectable levels of hydrocarbons were present in two deposit-feeding species, Phascolosoma agassizii and Macoma inquinata. These results suggest that mode of feeding is a determinate factor in the availability of sediment-sorbed hydrocarbons to benthic animals. Condition index of Macoma inquinata was sensitive to stress, with a significant reduction observed under unfavorable field condtions, as opposed to the laboratory. Condition index was reduced, but not significantly, in clams exposed to oil-contaminated sediment. Compared to sediment concentrations nickel, zinc, and seleium in Macoma inquinata. Other compounds were present at levels similar to or lower than those of sediment. Exposure to oil-contaminated sediment did not appear to affect trace metals content of either species. Individual variation of trace metals content in M. inquinata was relatively low. (Sinha - OEIS)
W78-04456

STRATIGRAPHY AND EVOLUTION OF BOGS IN MIRE TERRITORY OF THE RIGHT-BANK FOREST-STEPPE, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Dept. of Geobotany and Palebotany.
For primary bibliographic entry see Field 2H.
W78-04475

AN EVALUATION OF A COMPUTER SIMULATION MODEL OF PLANKTON DYNAMICS IN MONTEREY BAY,
Naval Postgraduate School, Monterey, CA.
D. E. Henrickson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 294, Price codes: A05 in paper copy, A01 in microfiche. Masters Thesis, September 1976. 93 p, 28 fig, 23 ref, 3 append.

Descriptors: *Evaluation, *Computer models, *Simulation analysis, *Plankton dynamics, *Monterey Bay(Cal), Phosphates, Zooplankton, Phytoplankton, Forcing functions, Upwelling, Advection, Predation pressure, Radiation index, Algal sinking, Systems analysis, Equations, California.

A computer simulation model of the phosphate, phytoplankton and zooplankton dynamics in Monterey Bay has been examined and modified. The model is driven by four forcing functions expressed as annual cycles of upwelling velocity, incident solar radiation, mixed layer depth, and mixed layer temperature. An alternate upwelling index has been developed based on the local wind field. A revised radiation index is employed based on the generation of both advective fog and low stratus cloud cover common during upwelling on the California coast. Analysis of the model's response to sinking and advection of phytoplankton has been examined. The importance of seasonal increases in predators has been introduced as a controlling factor in the seasonal growth of zooplankton. The model is able to predict the seasonal trends of phosphate, phytoplankton, and zooplankton throughout the year. (Bell-Cornell)
W78-04480

POPULATION OF BENTHIC MACROINVERTEBRATES IN HAM'S LAKE,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
J. L. Wilhm, D. Barker, E. Clay, and N. McClintock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 037, Price codes: A02 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, December 1977. 20 p, 2 fig, 9 tab, 23 ref. OWRT A-067-OKLA(1). 14-34-0001-7076.

Descriptors: *Artificial destratification, *Dissolved oxygen, Sediments, Sedimentation rate, Sediment particle size, Organic carbon, Hemolymph ions, Osporegulation, *Oklahoma, Invertebrates, Water pollution effects, Benthos, Aquatic populations, Copper, Iron, Manganese, *Ham's Lake(Okla), *Chaoborus punctipennis, Phosphorus.

Ham's Lake, Oklahoma, was destratified during summer 1976 by pumping surface water to the bottom. Number of species, diversity, and density of benthic macroinvertebrates were significantly correlated with the concentration of dissolved oxygen, while none of the biotic variables was correlated with temperature. Percent loss on ignition and CaCO(3) of the sediments generally decreased with increasing sediment depth. During 1977 pumping was not applied. The variables measured will be compared with values obtained in 1978 when the lake will again be destratified. In 1977 the lake had stratified thermally and chemically by 15 April. The depth of sediment deposited averaged 3.6 mm/month of 261 g/m(2) per month. Sediment particle size was less at the 8 m stations than at the 2 m stations. Percent organic carbon in the sediments ranged from 1.0-8.6. A gradual decrease in hemplymph ions (Na+, K+, CL) in Chaoborus punctipennis was observed from May through September and a return to higher concentrations in October. The lake water at the bottom contained low concentrations of these ions until August. A decrease in osmotic pressure was measured in C. punctipennis during the summer reflecting the trends in fluctuation of hemolymph ions. Measurements were also made of the concentration of copper, iron, manganese, and phosphorus of the water and sediments and the distribution and diversity of benthic macroinvertebrates. These data will be reported in a supplement to this report.
W78-04493

WATER QUALITY AT FIVE PROPOSED INDUSTRIAL SITES ON THE ROANOKE AND NEW RIVERS,
Nuclear Regulatory Commission, Washington, DC. Office of Nuclear Reactor Regulation.
J. H. Wilson, and K. L. Dickson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 028, Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 84, November 1977. 79 p, 11 tab, 1[illegible] fig, 23 ref, 2 append. EPA Training Grant WP-166.

Descriptors: *Water quality, Virginia, *Environmental effects, *Sites, Industrial plants, Ecology, Baseline studies, Nitrates, Invertebrates, Benthos, Aquatic populations, *New River(Va), *Roanoke River(Va), Biological assessment, *Baseline ecological surveys, *Environmental impacts.

Aquatic ecological surveys were conducted at five potential industrial development sites in Virginia, four on the New River and one site on the South Fork of the Roanoke River. Eighteen physical-

chemical parameters were analyzed and biological information was collected in order to determine the physical, chemical, and biological water quality. This study was designed to generate baseline information essential in assessing the environmental impacts of future development in the watershed. The results indicate that the New River and the South Fork of the Roanoke River support diverse populations of macrobenthic invertebrates and that physical and chemical water quality is high, except for increased levels of nitrate in the New River. Although both rivers have water quality that is considered good by biological and chemical standards, they are vulnerable. If the assimilative capacity of these two rivers is to be preserved as a valuable resource, they must be used intelligently. Future industrial development should be managed carefully in these watersheds to maintain the high quality of the aquatic environment in the New River and the South Fork of the Roanoke River.
W78-04497

PHOSPHORUS ACCUMULATION-DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
F. L. Spangler, C. W. Fetter, Jr., and W. E. Sloey.
Water Resources Bulletin, Vol. 13, No. 6, p 1191-1201, December 1977. 3 fig, 2 tab, 10 ref. EPA R803794, S801042.

Descriptors: *Phosphorus, *Bulrushes, *Nutrient removal, *Aquatic plants, *Phosphates, Marshes, Fertilizers, Sediments, Pollutants, Water quality, Waste water treatment, Marsh plants, Water pollution, Aquatic environment, Standing waters, Path of pollutants, Water pollution sources, Nutrients, *Wetland waste treatment.

Artificial and natural marshes were studied to determine changes in quality of polluted water passing through them. Phosphorus removal ranged from 0 to 64%. Removals in the 35% range were common, however. Much of the phosphorus went into sediments and unharvestable plant parts. Harvesting vegetation removed 6% of the phosphorus put into the system. Accumulation of phosphorus during the growing season was about 20 gP/sq m, much of which was flushed out after the onset of freezing weather. The amount of phosphorus flushed out can be prevented from entering a lake or stream by handling the marsh discharge in one of three ways: irrigate on land, lagoon to recycle later, treat conventionally if facilities are available. (Henley-ISWS)
W78-04501

TOXIC METALS IN SURFACE WATERS FROM COAL ASH,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Envrontemental Studies.
For primary bibliographic entry see Field 5A.
W78-04502

THE GREAT LAKES CLEANUP,
International Joint Commission-United States and Canada. Great Lakes Regional Office.
For primary bibliographic entry see Field 5G.
W78-04586

ALGAL CANCER AND ITS CAUSES: I. CARCINOGENIC POTENCIES OF WATER AND SUSPENDED SOLIDS DISCHARGED TO THE RIVER OHMUTA, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
S. Tshio, K. Kawabe, and T. Tomiyama.
Bull Jap Soc Sci Fish. 38(1), p 17-24, 1972.

Descriptors: *Algal cancer, Aromatic compounds, *Carcinogenic potential, Discharge(Water), *Japan(River Ohmuta), *Nitrogenous compounds, Porphyra-tenera, Rivers, *Suspended solids, Water, Mud deposits, Bottom deposits.

Carcinogenic potencies were tested with the waste water taken during the ebb tide of the river Ohmuta, Japan, and also with mud deposited on the sea bottom, about 1.5 km north from the mouth of the river. The waste water showed poor carcinogenic effect when diluted to a concentration as low as that found in the areas under cultivation where this disease can be easily detected. The mud induced cancers on Porphyra tenera during a 36-day culture after a single contact for periods ranging 80-320 min. The cancerous disease of P. tenera is due to suspended solids in the sea bottom mud which is probably derived from the Ohmuta river as evidenced from the distribution of nitrogenous aromatic compounds in the bottom mud.--Copyright 1973, Biological Abstracts, Inc.
W78-04596

THE COMPARISON OF SLUDGE EXTRACTS AND CHU 10 IN CULTIVATING CHLORELLA PYRENOIDOSA,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5E.
W78-04616

ACCLIMATION OF FATHEAD MINNOWS AND LAKE TROUT TO RESIDUAL CHLORINE AND BROMINE CHLORIDE,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
G. M. DeGraeve, and R. W. Ward.
Journal Water Pollution Control Federation, Vol 49, No 10, p 2172-2178, October, 1977. 3 tab, 17 ref.

Descriptors: *Environmental effects, *Chlorination, *Bioassay, Aquatic life, Fish, *Minnows, Trout, Toxicity, Waste disposal, Effluents, Disinfection, Bromine, Resistance, Lethal limit, Water pollution effects, *Lake trout.

Previous studies on the effects of the total residual chlorine (TRC) and total residual bromine chloride (TRBC) in waste water effluents on aquatic life have suggested that fish are able to tolerate higher levels if levels are initially low and gradually increased. Experiments were conducted at the Grandville, Michigan, waste water treatment plant to determine if fathead minnows and lake trout previously exposed to TRC or TRBC could acclimate and survive in effluents having TRC or TRBC levels above their respective 96-hour TL50 values. The experiments also examined the 7-day survival rate of fathead minnows at maximum TRC levels after previous exposure to sub-lethal levels. The relationships between acclimation time, concentrations of TRC during acclimation, and degree of acclimation achieved by fathead minnows were determined. Results indicated that fathead minnows and lake trout with previous exposure to TRC or TRBC for more than 2 hours did acclimate more readily to chlorinated or chlorobrominated effluents. A linear relationship was observed between previous exposure and tolerance to residual halogen levels in excess of 96-hour TL50 values. Prior exposure to TRC for 4 hours or longer created greater tolerances to TRC in fathead minnows. High TRC concentrations were lethal, regardless of previous exposure history. (Schulz-FIRL)
W78-04617

OCCURRENCE OF ASPERGILLUS FUMIGATUS DURING COMPOSTING OF SEWAGE SLUDGE,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.; and Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
P. D. Millner, P. B. Marsh, R. B. Snowden, and J. F. Parr.
Applied and Environmental Microbiology, Vol. 34, No. 6, p 765-773, December, 1977. 1 fig, 3 tab, 48 ref.

Descriptors: *Sludge, *Pathogenic fungi, *Waste storage, *Spores, *Aeration, Environmental sanitation, Sludge treatment, Sewage disposal, Air pollution, Thermophilic bacteria, Waste water treatment, *Aspergillus fumigatus.

The presence of Aspergillus fumigatus, a fungus which affects the respiratory system, was investigated in sludge, compost, woodchips, and commercial potting mediums. A. fumigatus was detected in all stages of composting; high levels were especially prevalent in crude and screened compost and in stored woodchips from stockpiles older than one month. Levels of the fungus decreased significantly with an increase in the age of the stored compost, yielding negligible levels in compost stored more than six months. Sludge samples indicated that soil type and location could influence A. fumigatus. Levels detected in commercial potting soils varied from undetectable traces to amounts comparable to those detected in one-month-old storage compost. Temperatures greater than 60C in compost limited the growth of A. fumigatus significantly. Airborn spora of the fungus were more abundant in compost sites exposed to air than in noncompost sites, a finding that supports the need for caution by treatment facilities employees with histories of respiratory problems. (Lisk-FIRL)
W78-04621

ENVIRONMENTAL PROBLEMS OF INDIA AND THEIR POSSIBLE TRENDS IN FUTURE,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 5G.
W78-04643

DAMAGE TO POLLUTED LAKES CAN BE REVERSED, STUDY SAYS.
For primary bibliographic entry see Field 5G.
W78-04646

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON NITROSAMINES.
Environmental Protection Agency, Research Triangle Park, NC. Office of Research and Development.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 055, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/6-77-001, June 1977. 109 p, 14 fig, 20 tab, 360 ref.

Descriptors: *Public health, Control, Environmental effects, Water pollution, Pollutant identification, Epidemiology, Chemical analysis, Nitrogen compounds, Air, Food webs, Water supply, Ecology, Nitrites, Monitoring, Measurement, *Nitrosamines, Carcinogens, *Amines.

Possible deleterious effects on human health and welfare of N-nitrosamines (NA) in the environment are reviewed and evaluated. Sources, distribution, measurement, and control technology for NA and their precursors are also considered. NA (characterized by the N-N = 0 group) are formed by the reaction of amines with nitrous acids. Nearly 70% of all N-nitroso compounds studied have been found to be carcinogenic, with a wide range in potency in all species of laboratory animals tested via all routes of administration. The experimentally produced carcinogensis appears to be caused by metabolites rather than by NA themselves. Epidemiological studies to date do not show a direct relationship between exposure to NA and cancer in man. Ambient air concentrations of NA of up to 36 micrograms/cubic meter have been found near an emission source, and of up to 0.2 microgram/cubic meter in major population centers. The relative contributions of natural and man-made sources of NA are indeterminable at present. Average dietary intake of NA is not likely to exceed a few micrograms/day, and intake of NA in municipal drinking water would probably be

much less than 1 microgram/day. NA in cigarettes range from 0 to 180 ng/cigarette. Recommendations are made for research on biological effects of exposure; population exposure patterns; epidemiological patterns related to NA; environmental distribution,
W78-04659

ENTRAPMENT AND IMPINGEMENT OF FISHES BY POWER PLANT COOLING-WATER INTAKES: AN OVERVIEW,
California Univ., Davis. Div. of Wildlife and Fisheries Biology.
For primary bibliographic entry see Field 8I.
W78-04661

TOXICITY OF CADMIUM TO GOLDFISH, CARASSIUS AURATUS, IN HARD AND SOFT WATER,
Brock Univ., St. Catherines (Ontario). Dept. of Biological Sciences.
L. S. McCarty, J. A. C. Henry, and A. H. Houston.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 1, January 1978, p 35-42, 6 fig, 25 ref.

Descriptors: *Environmental effects, Water quality, Fish, Mortality, *Cadmium, *Toxicity, Water properties, *Hardness(Water), *Goldfish, Water pollution effects.

Variations in the form of cadmium and its concentrations and in water quality were monitored during static bioassays conducted with soft (approximately 20 mg/l CaCO3) and hard (approximately 140 mg/l CaCO3) water. Mortality of the test animals was complete within 16 and 24 h after exposure to 5 and 10 mg/L solution in soft water. LC50 values of 2.76, 2.13, and 1.78 mg Cd/L were estimated on the basis of 48-, 96-, and 240-h periods of observation. The situation in hard-water trials was more complex with only the highest (60 mg Cd/L) and lowest (30 mg Cd/L) effective test concentrations leading to simple sigmoidal cumulative mortality curves. On the basis of 48-, 96-, and 240-h exposures, LC50 values of 46.9, 46.8, and 40.2 mg Cd/L were estimated. (Chilton-ORNL)
W78-04662

A TAXONOMIC AND ECOLOGICAL STUDY OF SOME ALGAE IN TWO PONDS IN SOUTH SHELBY COUNTY, TENNESSEE,
Memphis State Univ., TN.
For primary bibliographic entry see Field 2H.
W78-04663

INVESTIGATIONS OF THE IMPACT OF MERCURY ON ENCLOSED WATER COLUMNS USING A ZOOPLANKTON SIMULATION MODEL,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5A.
W78-04665

RELATIVE TOXICITY OF FREE CYANIDE AND DISSOLVED SULFIDE FORMS TO THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
S. J. Broderius, L. L. Smith, Jr., and D. T. Lind.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 12, December 1977, p 2323-2332, 2 fig, 5 tab, 29 ref.

Descriptors: Environmental effects, *Toxicity, Fish, *Cyanide, *Sulfides, *Hydrogen sulfide, Hydrogen ion concentration, Toxicology, *Minnows, Water pollution effects, Gill permeability theories.

This study was designed to define the change in tolerance limits of the fathead minnow to free cyanide and dissolved sulfide forms as a function of pH. 96-h LC50 concentrations of free cyanide and molecular HCN did not differ greatly and were fairly constant in the pH range of 6.8-8.3. At pH 9.3, the values diverged with the free cyanide values increasing while the HCN values decreased. Except for some increase with rise of pH from 6.5 to 7.1, the 96-h LC50 concentrations of molecular H2S decreased as the pH increased. It was concluded that the acute toxicity to fathead minnows of free cyanide and dissolved sulfide does not depend entirely on the concentration of ambient molecular HCN or H2S, but that the CN and HS anions penetrate the gill epithelium less readily than do the molecular forms and increasingly enhance the toxicities of these solutions as the test pH increases. (Chilton-ORNL)
W78-04666

RELATIONSHIPS OF FISH YIELD TO LAKE PHYTOPLANKTON STANDING CROP, PRODUCTION AND MORPHOEDAPHIC FACTORS,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
For primary bibliographic entry see Field 2H.
W78-04667

AQUATIC EFFECTS OF STEAM-ELECTRIC GENERATING PLANTS: FEDERAL REGULATIONS AND POSSIBLE IMPACTS ON MULTIPURPOSE RESERVOIRS IN OKLAHOMA,
Texas Instruments Inc., Dallas. Ecological Services.
P. L. Zweiacker, and L. G. Bowles.
Annals of the Oklahoma Academy of Science, No. 5, 1976, p 124-135, 4 fig, 3 tab, 14 ref.

Descriptors: *Environmental effects, *Powerplants, *Oklahoma, Reservoirs, Evaluation, Forecasting, *Cooling water, Entrainment, *Thermal pollution, Chemicals.

The objective of this study is the prediction or evaluation of the ecological effects of existing or proposed power plants in Oklahoma. There are approximately 22,848,700 acre-feet of storage capacity in existing multipurpose Oklahoma reservoirs with a potential of an additional 26,419,900 acre-feet. Most of the cooling water used by electric power plants is obtained from rivers and places little demand on water resources. Because of the widespread use of closed-cycle cooling systems, impingement is not expected to present a statewide problem. The majority of Oklahoma plants have cooling towers where entrainment mortality is probably 100%. Entrainment problems could be significant if the intake is located in a major spawning area and if the quantity of makeup water constitutes a large percent of the total water body. Widespread use of closed-cycle cooling systems indicates that thermal pollution should not be a problem. Chemical pollution is plant-specific. (Chilton-ORNL)
W78-04668

EVIDENCE FOR PARTIAL DEGRADATION OF TOXAPHENE IN THE AQUATIC ENVIRONMENT,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W78-04674

EFFECTS OF MERCURY AND TIN ON FRUSTULAR ULTRASTRUCTURE OF THE MARINE DIATOM, NITZSCHIA LIEBETHRUTTI,
Hawaii Univ., Honolulu. Dept. of Botany.
E. M. Saboski.
Water, Air, and Soil Pollution, Vol. 8, 1977, p 461-466, 10 fig, 1 tab, 4 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Tin, *Diatoms, Frustules, Abnormalities.

A culture series was established with diatoms in seawater containing 1.5 microg at/L of Sn- or Hg-ion. Frustule abnormalities were observed to be greater for the Hg- and Sn-ion treated cells than for control cells. Abnormalities common to both Hg and Sn were such features as reduction in length to width ratios, fused carinal dots and change in numbers of carinal dots. Tin treated cells had frustules with two unique abnormalities: carinal dots aligned parallel to the raphe and raphes that were curved. It was suggested that abnormalities may result from enzyme disruption either at the silicon deposition site or at the nuclear level and that Hg or Sn might be found as part of the molecular structure of the abnormal frustules. Only Sn was detected on the surface of the frustule by x-ray probe analysis. Mercury analysis of the frustules was inconclusive. (Chilton-ORNL)
W78-04675

EVALUATION OF 'CAM-1', A WARNING DEVICE FOR ORGANOPHOSPHATE HAZARDOUS MATERIAL SPILLS,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5A.
W78-04679

5D. Waste Treatment Processes

BARK AS A NONINERT TRICKLING FILTER MEDIUM FOR PULP MILL EFFLUENT,
Mississippi State Univ. Mississippi State.
G. R. Lightsey, and J. W. Mitchell.
AIChE Symposium Series, Vol. 72, No. 157, p 112-120, 1976. 11 fig, 7 tab, 14 ref. OWRT A-100-MISS(2).

Descriptors: *Trickling filters, *Porous media, *Bark, *Pulp and paper industry, *Suspended solids, Pulp wastes, Pilot plants, Filtration, Industrial wastes, *Waste water treatment.

Studies were conducted to evaluate the use of pine bark as a trickling filter medium for dewatering primary sludge and for reducing the BOD, COD, and color of the liquid fraction of sludge and bleach plant effluent. Three low rate trickling filter models were used in tests with primary sludge which was recomposed from a kraft pulp and paper mill primary clarifier bottom sludge that had been dewatered to approximately 30% solids by weight. Five filter models were tested with bleach plant effluent from a bleached kraft pulp mill. Filter depths ranged from 1 to 6 ft, and hydraulic loading rates of 1.15-36.8 gal/sq ft/day were used. Tests with primary sludge indicated that a pine bark medium trickling filter was capable of dewatering the sludge to 18% solids and could remove 70-95% of the BOD. At the optimum hydraulic loading rate of more than 4.59 gal/sq ft/day the filter was capable of removing up to 40% of the COD in the liquid fraction of primary sludge. An increase in the nitrogen content of the pine bark medium after filtration suggested that it could be used as an effective soil conditioner. The color and conductivity of the bleach plant effluent were not significantly reduced by passage through the bark trickling filter, although up to 95% of the BOD and 40% of the COD were removed. The optimum loading rate for a single pass, pine bark media trickling filter on the basis of BOD and COD removal was determined as 0.20 gal/sq ft/day. (Schulz-FIRL)
W78-04270

DETECTION OF TRINITROTOLUENE IN WATER BY FLUORESCENT ION-EXCHANGE RESINS,
Naval Weapons Center, China Lake, CA.
For primary bibliographic entry see Field 5A.
W78-04271

CHEMICAL PRODUCTS PLANT SOLVES PROBLEM OF CONTAMINATED WASTE-WATER,
Reichhold Chemicals Ltd. Sainte Therese (Quebec).
C. Charette, and J. Herbineaux.
Water and Pollution Control, Vol. 115, No. 10, p 21, 24-26, October, 1977. 2 tab.

Descriptors: *Chemical wastes, *Resins, *Phenols, *Biological treatment, *Clarification, Treatment facilities, Aeration, Industrial wastes, Sludge treatment, Equipment, Chemical oxygen demand, Waste water treatment.

The chemical products plants of Reichhold Chemicals Limited at Ste. Therese, Quebec, Canada, uses batch production processes in the manufacture of phenolic, urea formaldehyde, alkyd, and polyester resins. A biochemical system had been installed in 1972 for the treatment of waste water from product transfer and cleaning operations which had been previously discharged directly to the municipal sewer system. The system included two 8 foot-deep aerated lagoons, the first of which was used for equalization and the second for biological treatment. Since the system did not have a secondary clarifier, biomass recycling became necessary. A biokinetic design study program was used to evaluate the LIGHTNIN integrated secondary clarifier manufactured by Greey Mixing Equipment Limited. Modifications to the existing facilities included the conversion of three surface aerators to submerged turbine units, and the installation of a clarifier at the outlet end of the original aerated lagoon. The use of submerged turbine aerators allows operation of the system at maximum MLSS concentrations. Effluents are monitored at various locations in the treatment system for pH, phenol, phosphate, formaldehyde, and COD concentrations. An automatic alarm system is used to prevent accidental pollutant discharge due to mechanical failure of system components. (Schulz-FIRL)
W78-04272

TERTIARY WATER TREATMENT FOR ANAEROBIC EFFLUENTS--REDUCES THEIR BOD AND PRODUCES A FERTILISER BY-PRODUCT.
French Patent FR 2336-353. Issued August 26, 1977. Derwent French Patents Abstracts, Vol. Y, No. 43, p 4-5, December, 1977.

Descriptors: *Tertiary treatment, *Fertilizers, *Biochemical oxygen demand, *Nutrient removal, *Patents, *Phosphorus, *Anaerobic conditions, Aerobic treatment, Industrial wastes, Food processing industry, Activated sludge, Sewage treatment, Waste water treatment.

A patent has been issued for a tertiary waste water treatment process to be used with anaerobic, high BOD effluents such as activated sludges, sewage, and alcohol distillery effluent. Slaked lime is added to the anaerobically-treated organic effluent to create alkaline conditions. Carbon dioxide is passed through the treated water to bring about the removal of phosphorus as a solid. The ammonia is separated from the waste water, adsorbed in an ion exchanger, and treated with acid to convert it to an ammonium salt. The waste water then undergoes aerobic treatment and the phosphorus-containing solid is removed. The method produces a fertilizer by-product which contains nitrogen and phosphorus. (Schulz-FIRL)
W78-04273

PHOTOSYNTHETIC BACTERIA IN WASTE TREATMENT--ROLE OF RHODOPSEUDOMONAS CAPSULATA IN AGRICULTURAL/INDUSTRIAL EFFLUENTS,
New South Wales Univ., Kensington (Australia). School of Biological Technology.
H. Sawada, R. C. Parr, and P. L. Rogers.
Journal of Fermentation Technology, Vol. 55, No. 4, p 326-336, 1977. 5 fig, 10 ref.

Descriptors: *Nutrient removal, *Biochemical oxygen demand, *Photosynthetic bacteria, *Primary productivity, Biological treatment, Organic wastes, Algae, Microorganisms, Chemical oxygen demand, Industrial wastes, Waste water treatment.

Laboratory studies were used to examine the use of Rhodopseudomonas capsulata, a typical photosynthetic bacterium, for the treatment of agricultural/industrial waste waters which contain high levels of BOD. Photosynthetic bacterial action was evaluated with three types of industrial effluents, including wood scour liquor, slaughterhouse waste water, and waste water from an antibiotic factory which manufactured Erythromycin. Studies with batch cultures indicated that the three effluents could support strong growth of R. capsulata, although COD and BOD were not significantly reduced in the process. R. capsulata acted as primary microbial flora in competition for nutrients with heterotrophic bacteria in the slaughterhouse and wool scour effluents, and as secondary microbial flora utilizing higher levels of total volatile acids in the antibiotic factory effluent. Although secondary algal growth was observed in batch cultures with wool scour effluent, the algal growth predominated over photosynthetic bacterial growth during the second stage of two-stage continuous treatment. Higher COD reductions in the two-stage system were attributed to higher levels of microbial activity. (Schulz-FIRL)
W78-04274

NEW CONCEPTS IN TREATMENT OF POULTRY PROCESSING WASTES,
Maine Univ. at Orono. Dept. of Civil Engineering.
F. E. Woodard, M. W. Hall, O. J. Sproul, and M. M. Ghosh.
Water Research, Vol. 11, No. 10, p 873-877, 1977. 2 fig, 6 tab.

Descriptors: *Food processing industry, *Poultry, *Industrial wastes, *Coagulation, *Flotation, Pilot plants, Design criteria, Organic wastes, Clarification, Waste water treatment.

A medium-sized poultry processing plant in Belfast Bay, Maine, was the site of a study to develop, design, and operate a new type of system for poultry processing waste water. The system includes a chemical coagulation-dissolved air flotation process which provides secondary treatment in a single stage. The flow of water and poultry through the plant and the routing and volume of waste water flows are described. Average daily waste discharges at the plant include 0.91 mgd water, 5160 lbs BOD, 2600 lbs suspended solids, and 2155 lbs grease. Various modifications were made within the plant to reduce the total volume of waste water generated, including the installation of on-off nozzles on all washdown hoses and at all hand wash stations. Preliminary studies were performed to determine the optimum dosages of aluminum sulfate, soda ash, and cationic polyelectrolyte for the treatment system. In the prototype dissolved air flotation system, waste water passes through a series of rotary screens and an alum solution is added. It then passes through a bar rack and a grit chamber on its way to a wet well where coagulation of the alum flow takes place. The alum floc is dosed with an anionic polymer in the discharge pipe leading to the flocculation tank. Sludge is periodically removed from the air flotation unit and transferred to sludge retention tanks. The clarified effluent is chlorinated prior to discharge. (Schulz-FIRL)
W78-04275

DETERMINATION OF SLUDGE YIELD AND THE SLUDGE DECOMPOSITION COEFFICIENT IN ACTIVATED SLUDGE TREATMENT OF WASTE WATER FROM SOYBEAN CURD MANUFACTURE, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Fermentation Technology.
S. Nagai, K. Tai, and T. Tendo.
Hakkokogaku Kaishi, Vol. 55, No. 5, p 289-293, 1977. 3 fig, 4 tab, 3 ref.

Descriptors: *Food processing industry, *Activated sludge, *Biological treatment, *Sludge treatment, Organic loading, Chemical oxygen demand, Biodegradation, Organic wastes, Industrial wastes, Waste water treatment.

Laboratory experiments were used to evaluate the use of the activated sludge process for the treatment of waste from soybean curd manufacture. Chemical analyses of the waste water revealed a BOD of 13,000 ppm, COD of 10,000 ppm, suspended solids of 380 ppm, nitrogen of 560 ppm, phosphorus of 20 ppm, and total organic carbon of 7,200 ppm. The laboratory-scale system included an aeration vessel with a volume of 1.2 liters and an 0.2-liter settling vessel. The system was capable of removing 92-97% of the organic matter in the waste water. Continuous flow experiments at dilution rates of 0.5-2.0/day resulted in sludge yields of 0.6 g MLSS/g COD and a sludge decomposition coefficient of 0.12/day. Mass balance equations were used to calculate the organic loading rate at which excess sludge would not be produced. Experiments at a loading rate of 0.13 g COD/g MLSS/day verified the predictions from mass balance calculations. (Schulz-FIRL)
W78-04276

ENVIRONMENTAL CONSIDERATIONS AND THE MODERN ELECTROLYTIC ZINC REFINERY.
Mining Engineering, Vol. 29, No. 11, p 31-33, November, 1977.

Descriptors: *Zinc, *Mineral industry, *Recycling, *Water reuse, Monitoring, Metals, Industrial wastes, Acidic water, Copper, Waste water treatment.

Rising energy costs and stricter effluent regulations have encouraged energy-saving modifications in the waste water treatment and disposal practices of electrolytic zinc refining operations. Newly constructed zinc refineries must meet Best Available Control Technology effluent standards for total suspended solids, araenic, cadmium, selenium, zinc, and pH. Modern hydrometallurgic processes for extracting zinc from comples ferrites include the hematite process, the jarosite process, the goethite process, and the conversion process. Environmental considerations have limited the jarosite and goethite processes since waste waters must be neutralized and freed of heavy metal hydroxides prior to discharge. Waste generation within any given process can be minimized by maximum recycling of treated water to the plant, maximum reuse without pretreatment of lightly contaminated water within the plant, and careful control of the water balance. The zinc plant designed by Kaiser Engineers provides maximum recycling and minimum consumption through separation of treatment streams into non-recycleable and recycleable effluents. Three lines ponds with a minimum eight-year storage capacity will contain leach residues for gradual feed to the treatment system. Effluent discharges will be reduced to 7-10% of the plant's total intake of water. (Schulz-FIRL)
W78-04277

POSSIBILITIES OF TREATING ELECTROPLATING SHOP WASTE WATERS WITHOUT GENERATING SPECIAL WASTES. METAL RECOVERY IN PLACE OF SLUDGE DISPOSAL (MOEGLICHKEITEN ZUR BEHANLDLUNG GALVANISCHER ABWAESSER UNTER VERMEIDUNG VON SONDERABFAELLEN, METALLRUECKGEWINNUNG STATT SCHLAMMDEPONIE),
R. Kammel, and H. W. Lieber.
Galvanotechnik, Vol. 68, No. 9, p 789-794, September, 1977. 5 fig.

Descriptors: *Electrodialysis, *Metals, *Membrane processes, *Recycling, *Industrial wastes, Effluents, Separation techniques, Iron, Zinc, Copper, Chromium, Waste water treatment.

Theoretical and practical aspects of cementation and electrodialysis are discussed with respect to the separation of metals from galvanic baths and electroplating effluents. Cementation is suitable for the removal of trace amounts of foreign metals such as copper and chromate ions from zinc baths by the addition of zinc powder. Copper has been removed from acid solutions by the addition of iron sponge or other iron objects with large specific surface areas. Cementation has also been used in the removal of gold and silver from cyanide baths. Electrodialysis with premo-selective membranes has been used to separate iron from sulfuric acid solutions used in iron pickling and to remove copper ions from chromic acid solutions. Current technology in electrodialysis is not amenable to the regeneration of baths which contain organic contaminants. (Takacs-FIRL)
W78-04278

REDUCING POLLUTION CONTROL COSTS OF ELECTROPLATING PROCESSES,
IBM Corp., San Jose, CA. General Products Div.
L. Missel.
Plant Engineering, Vol. 31, No. 25, p 125-127, December, 1977. 2 fig.

Descriptors: *Recycling, *Metals, *Water consumption, *Industrial wastes, *Chromium, Acidic water, Effluents, Nitrogen compounds, Industrial wastes, Costs, Equipment, Waste water treatment.

Process modification and raw material substitution to prevent or reduce the formation of toxic wastes in industrial operations has been suggested for the electroplating industry. Since waste treatment and chemical costs are incurred through the loss of process solutions during product transfer, various methods to minimize losses are suggested, including lengthening the drainage time, using spray nozzles to return solutions to processing tanks, adding wetting agents to plating solutions to maximize drainage from parts, and using low concentration and low viscosity solutions in plating tanks. Countercurrent rinsing of parts by gravity overflow and agitating the parts to move waste products away from part surfaces are suggested methods of reducing the total effluent volume. Fluorinated wetting agents, floating plastic balls, and chemical foam blankets are recommended for suppression of spray from plating baths. The rejuvenation of spent chromic acid has been accomplished with dilution and ion-exchange treatment in chromium plating, conversion coating, chemical polishing, anodizing, and similar operations. Alternatives to cyanide-based plating processes are described. The use of deionized water in bath solutions and intermediate rinses is suggested to reduce buildup of contaminants in plating baths. (Schulz-FIRL)
W78-04279

COMPOSITION OF EFFLUENTS FROM THE BLEACHING OF SPRUCE SULPHATE PULP (ZLOZENIE ODPADOVYCH VOD Z BIELENIA SMREKOVEJ SULFATOVEJ BUNICINY),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W78-04280

MECHANICAL FOAM BREAKER--MEANS FOR FOAM CONTROL IN WASTEWATER TREATMENT,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
K. S. Ng, and L. Gutierrez.
Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2310-2317, November, 1977. 7 fig, 4 tab, 14 ref.

Descriptors: *Foaming, *Pulp wastes, *Pulp and paper industry, *Turbines, Industrial wastes, Equipment, Pilot plants, Turbine blades, Effluents, Waste water treatment.

Pilot-scale studies were used to evaluate the performance of a turbine foam breaking system as a means of detoxifying bleached kraft whole mill effluents. Principle agents involved in the breaking of foam by turbines include suction, shear, and centrifugal forces. The 0.38 cu m/min foam separation pilot plant included units for foam generation, separation, and collapsing. The foam collapsing system included a 0.97 cu m foam collection tank and a 0.25 kw variable speed turbine centrally mounted in the tank. Foam breaking efficiency and power consumption were evaluated with respect to impeller geometry, blade number, and mode of operation. A three-blade, vaned disc turbine operating in a single flow-through mode was recommended as the optimum configuration for foam breaking. Turbine size, rotation speed, tip velocity, and foam flow were cited as major process variables. An equation is presented for foam breaking capacity with respect to rotation speed and turbine diameter. Power consumption is related to foam breaking capacity, rotation speed, and turbine diameter. Capital costs for a foam breaking system designed for handling 56.6 cu m/min of foam at a 680 tpd mill are projected at $108,000. Power requirements for such a system are estimated at 252 kw. (Schulz-FIRL)
W78-04281

CAN WETOX HANDLE SPENT SULFITE LIQUOR.
Canadian Chemical Processing, Vol. 61, No. 11, p 20-22, November, 1977. 1 fig.

Descriptors: *Sulfite liquors, *Oxidation, *Pulp and paper industry, Equipment, Liquid wastes, Industrial wastes, Chemical oxygen demand, Pulp wastes, Waste water treatment, *Wet oxidation.

The Canadian Ontario Research Foundation has investigated the use of wet oxidation for the treatment of spent sulfite liquors from the pulp and paper industry. Studies have indicated that the organic content in waste streams could be reduced by 85-90% at a cost of $.01/gal. Wet oxidation offers a viable alternative to incineration or biological treatment for waste streams which contain organic concentrations of 2-20%. The waste solution is heated to 200-300C and then passed to the wet oxidation reactor where compressed air is added to facilitate the oxidation of organics. Waste heat from the system can be used to preheat the influent stream or for other operations in the treatment plant. The Zimpro wet oxidation system was first applied to pulp wastes but has since been used in municipal waste water treatment. Low-rate units which operate at 180C and 2.5 MPa have been used to eliminate 5-10% of the BOD and condition sewage sludge for bacterial digestion. High-rate units which operate at 260C and 10 MPa pressure have been used for total destruction of organics. The Wetox process developed by the Ontario Research Foundation uses mechanical agitation to promote contact of the waste solution with injected air. At optimal operating conditions of 230C and 750 rpm stirrer speed, the COD is spent sulfite liquors is reduced 85-90%. Current research at the Ontario Research Foundation has been directed toward developing a titanium-lined reactor vessel. (Schulz-FIRL)
W78-04282

RECOVERY OF USEFUL BY-PRODUCTS FROM TEXTILE WASTES,
Shri Ram Inst. for Industrial Research, Delhi (India). Environmental Protection Cell.
P. K. Mair, A. K. Jain, and S. Purwar.
Indian Chemical Journal, Annual Number, 129-136, 1977. 2 fig, 3 tab, 16 ref.

Descriptors: *Textiles, *Recycling, *Water reuse, *Chemical wastes, *Activated carbon, Dyes, Fibers(Plants), Biochemical oxygen demand, Cotton, Industrial wastes, Waste water treatment.

The recovery of chemicals and water from textile effluents has been cited as a cost-effective means of pollution abatement. General characteristics are presented for waste water produced at a cotton finishing plant, a dyehouse, and a bank note printing press. Sodium hydroxide has been recovered from cotton textile mill discharges through evaporation and dialysis. Applying to textile wastes the Erco Envirotech salt recovery process, used for pulp and paper mill wastes, is suggested. Since approximately 45% of the total BOD load at a textile mill originates from the starch used in sizing baths, various processes have been considered for the recovery of carboxymethyl cellulose (CMC) and polyvinyl alcohol (PVA). Chemical precipitation with metallic salts has been used to recover 75-85% of the CMC in sizing bath effluents for reuse, while adsorption and molecular filtration have been used for PVA. Dyehouse wastes, another major source of pollution from the textile industry, contribute approximately 17-20% of the total BOD and 30% of the total effluent volume. Although the feasibility of dye recovery is highly dependent on the individual situation, further research into dye recovery is suggested. Research on the use of activated carbon in the treatment of textile waste water for reuse is described, as is the recovery of wool grease, cotton wax, and lube oils. The recovery of plant fibers and seeds is examined with respect to the production of animal feed supplements and the manufacture of spun yarn of non-woven textiles. (Schulz-FIRL)
W78-04284

EFFECT OF EFFLUENT COMPOSITION VARIABLES ON FLOCCULATION OF SUSPENDED SOLIDS IN LIME-SULFIDE UNHAIRING EFFLUENTS,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
E. H. Bitcover, W. F. Happich, J. E. Cooper, E. M. Filachione, and J. W. Harlan.
Journal of the American Leather Chemists Association, Vol. 72, No. 11, p 426-443, November, 1977. 12 tab, 10 ref.

Descriptors: *Flocculation, *Polyelectrolytes, *Suspended solids, *Tannery wastes, *Effluents, Coagulation, Industrial wastes, Hydrogen ion concentration, Salts, Organic wastes, Waste water treatment.

Previous studies have indicated that hair pulping and unhairing effluents which differ widely in composition require different polyelectrolytes for optimum flocculation and suspended solids reduction. Studies were conducted to quantify the effects of various parameters on flocculation processes. Unhairing effluents were obtained from a tannery which processes fresh hides in a paddle vat with a lime-sulfide hair pulping process and from a tannery which processes salt-cured hides with a hide processor and a lime-sulfide hair pulping formula. Fourteen coagulant aids were evaluated as flocculants for the unhairing effluents. These include a series of synthetic, high molecular weight, water-soluble, acrylamide-based, polyelectrolytes manufactured by Allied Colloids of Ridgewood, New Jersey; a series of inorganic colloids manufactured by Georgia Kaolin of Elizabeth, New Jersey; and other polyelectrolytes. Composition variables, including pH, salt content, suspended solids, and soluble organic material, were measured in several fractions of the unhairing effluents, including unscreened effluent, screened effluent, solids settled for 30 minutes, and supernatant liquor. Polyelectrolyte performance was evaluated with respect to effluent age, salt content, combined age and salt content, effluent dilution, effluent pH, and screening. (Schulz-FIRL)
W78-04285

USE OF HYDROGEN PEROXIDE TO CONTROL SULFIDE IN TANNERY WASTE STREAMS,
E. T. O'Neill.
The Leather Manufacturer, Vol 94, No 11, p 14-17, November, 1977.

Descriptors: *Hydrogen sulfide, *Anaerobic conditions, *Oxidation, *Chemical wastes, *Tannery wastes, Effluents, Sulfur compounds, Chemical reactions, Odor, Industrial wastes, Waste water treatment.

Tannery processes involve the use of a wide variety of chemicals, including lime, sodium sulfide, sodium dichromate, sulfuric acid, and ammonia compounds. The reduction of these chemicals in waste water streams can lead to the production of potentially dangerous hydrogen sulfide concentrations. The use of hydrogen peroxide for odor and sulfide control has been evaluated by several tanneries. At a tannery in the western part of the United States, sulfuric acid is first added to the waste stream to lower the pH from about 11.0 to 7.0. The daily waste stream normally contained 60,000 gal of raw processing waste water having high levels of lime and metallic salts and over 200 ppm of sulfides. Hydrogen peroxide was injected into a drainage channel leading from the hide processing vats to provide a concentration of 200 ppm during peak flow periods, and was also added to 21,000-gal holding tank. The oxidation processes effectively reduced hydrogen sulfice levels to below the required 0.5 ppm limit. Hydrogen sulfide has also been used at a mid-western tannery for the treatment of 87,000 gpd of highly alkaline waste water from dehairing operations. Iron pickly liquor which had been added to beam house wastes imparted a black color to the tannery effluent and only reduced the sulfides to a level of 35-50 ppm. After neutralization and hydrogen sulfide treatment to provide concentrations of 100 ppm in the waste stream, sulfide levels were reduced to below 1 ppm. (Schulz-FIRL)
W78-04286

THE INTERNATIONAL COOPERATION IN STUDYING THE HEALTH ASPECTS OF ORGANIC CONTAMINANTS IN INDIRECTLY REUSED WASTE WATER,
International Reference Center for Community Water Supply, Leidschendam (Netherlands).
B. C. J. Zoeteman.
Annals of the New York Academy of Sciences, Vol. 298, p 561-573, September, 1977. 2 fig, 6 tab, 24 ref.

Descriptors: *Water reuse, *Public health, *Sewage effluents, Organic compounds, Potable water, Water supply, Data collections, Toxins, Regulation, Western Europe.

Recent concern about the health effects of reuse of waste water for potable supply was prefaced by numerous discussions of the topic during the 1950's. Although direct reuse via sewage effluent recycling is mostly limited to pilot projects, many water supplied worldwide draw upon rivers with a high sewage content. A 1975 meeting convened by the WHO International Reference Centre for Community Water Supply dealt with the health effects of reuse practices. Several suggested fields for which international cooperation would be of great mutual benefit to the U.S. and Western Europe are examined in this paper. These include: (1) collaboration on data collection for individual organic compounds in water; (2) obtaining a consensus on standard test methods for toxicity of tap water and on specific criteria for residual toxicity of water, and; (3) exchanging information on national epidemilogic programs in relation to the health aspects of indirect water reuse, which is necessary to establish an internationally accepted methodology for such studies and to extrapolate results from one country to another. (Eberle-NWWA)
W78-04305

METHOD AND APPARATUS FOR PURIFYING EMULSIONS AND CONTAMINATED WATER WITH ELECTROLYSIS,
P. A. Valanti.
U.S. Patent No. 4,048,031, 5 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 962, No 3, p 737, September 13, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, *Electrolysis, Anodes, Cathodes, Flocculation.

An arrangement is provided for moving at least one aluminum anode with respect to a cathode, to maintain a fixed determined distance between the anode and cathode. An emulsion or contaminated water to be treated is run in the region between the electrodes, and means are provided for running the emulsion or water along the aluminum anode before it reaches the space between the electrodes. The flock is then removed from the resultant flocculated liquid. The electrodes are coupled to a low-tension direct-current source. By using suitable electrodes and an electrode distance of a few millimeters power consumption is greatly reduced. (Sinha-OEIS)
W78-04307

WATER PURIFICATION APPARATUS AND METHOD,
R. D. Cooksley.
U.S. Patent No. 4,045,293, 14 p, 15 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2211, August 30, 1977.

Descriptors: *Patents, *Water purification, Water quality control, *Water pollution treatment, *Potable water, Vaporization, *Condensation, Filtration, Foaming, Equipment.

In this water purification method, water containing impurities producting substantial foaming is heated in a boiler tank to produce steam and a contact surface member above the boiler tank is heated to a temperature substantially above the boiling point of water. Water droplets which may be carried by the steam vapors from the boiler and/or foam will be immediately vaporized as it comes in contact with the contact surface means. The steam vapors pass through a condenser assembly, and the condensate passes through a filter assembly before storage in a tank. The contact surface means comprises screen members providing a tortuous path and high heat conductivity. Baffle members may be interposed in the flow path for vapors from the boiler tank to the stack. Valves and a control circuite are included to automatically control the volume of water in the boiler, to cut off water flow to components and to drain the assembly upon shutdown. (Sinha - OEIS)
W78-04318

METHOD AND DEVICE FOR OXYGENATING WATER WITH VIBRATIONS AND UNDER PRESSURE STROKES,
P. H. Isteri.
U.S. Patent No. 4,045,336, 7 p, 3 fig, 25 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2223, August 30, 1977.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, *Aerobic treatment, *Oxygenation, Gases, Equipment.

This invention provides a device by means of which waste water can aerobically be cleaned by increasing the oxygen content in waste water. The invention is characterized in the gases are separated by pressure strokes on the liquid and/or by setting the liquid in vibrating motion after which a desired gas, e.g. oxygen, is fed into the liquid. Water flowing along a suction pipe is set to vibrate by means of a vibrator from where water is discharged into a tank and noxious gases escape from the water ghrough the tank opening. The water is sucked out of the tank by means of a propeller pump into the gas feed zone. The gas feed zone is connected to a source of gas and gas bubbles formed on wet surfaces of a dispersion means are mixed with flowing water. The propeller pump then presses the treated water into a supply pipe. (Sinha - OEIS)
W78-04319

APPARATUS FOR TREATING WASTE WATER,
Ishigaki Kiko Co., Tokyo (Japan). (Assignee).
I. Yokota.
U.S. Patent No. 4,045,344, 15 p, 15 fig, 3 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2226, August 30, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Microorganisms, *Aeration, Tubes, Equipment.

An apparatus for treating waste water such as sewage has at least one bundle of a number of straight tubes submerged in the waste water to be treated. The bundle is provided with crossing passages extending across the bundle and are arranged intermittently along the bundle with certain intervals between so that no Poiseuille flow is formed in each of the tubes. The waste water is flowed through the bundle of straight tubes in the direction of the bundle. Organic substances in the waste water are removed due to decomposition caused by microorganisms which adhere to the inner surface of each tube. Owing to the presence of the crossing passages, removal of the organic substances proceeds effectively and promptly due to uniform flow distribution across the bundle, a disturbance of flow given to the water propagation of various kinds of microorganisms. The apparatus is constructed so that air is jetted into the waste water to recirculate the water and also to enrich dissolved oxygen in the water. (Sinha-OEIS)
W78-04320

CLARIFICATION PLANT,
Heilmann and Littmann Bau A.G., Munich (West Germany).
J. Schleich, and H. Zwisler.
U.S. Patent No. 4,045,355, 9 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2230, August 30, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Settling basins, Oxidation lagoons, Treatment facilities.

A clarification plant is described in which the earth basin has an oval contour and surrounds the concentric partitions on one side in a concentrically semi-circle, but is elongated in an acutely tapering, arched curve on the other side including the outlet. Numerous advantages result from the oval basic shape of the earth basin. The water surface in the outer range is enlarged by the oval elongation so that the absorption of oxygen during final clarification is enhanced. Upright perforated air pipes open into the activating area and have openings arranged in such a manner that they release air in the same circumferential direction so that the waste water circulated in the activating area. (Sinha-OEIS)
W78-04321

SCUM SKIMMER APPARATUS,
Harsco Corp., Camp Hill, PA. (Assignee).
N. S. Glover.
U.S. Patent No. 4,046,693, 13 p, 9 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 296-297, September 6, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution control, Anaerobic conditions, Aquatic microorganisms, *Scum, Sludge treatment, *Skimming, Equipment.

In aerobic systems, microorganisms are mixed with waste water containing organics and aerated with oxygen for a predetermined amount of time. After aeration, the mixture is transferred to a settling zone or clarifier tank where the solid organic contaminants and microorganisms settle. The anaerobic sludge will eventually float to the top of the settling tank where is is referred to as scum. Removal of the floating particles and scum on the surface of the clarifier liquid is accomplished by a skimmer. The primary object of this invention is to provide a skimmer blade which is air lifted out of the clarified liquid upon movement away from the scum trough. The skimmer blade is adjustable in height to compensate for the varying height of the liquid in the clarifier tank. The scum skimmer skims in only one direction to eliminate stagnated areas at the end of the tank. (Sinha-OEIS)
W78-04329

PHOSPHOROUS REDUCTION FROM CONTINUOUS OVERFLOW LAGOONS BY ADDITION OF COAGULANTS TO INFLUENT SEWAGE,
Ontario Ministry of the Environment, Toronto.
H. J. Graham, and R. B. Hunsinger.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 65, 1977. 76 p, 43 fig, 2 tab, 6 ref, 3 append. 71-1-16, 71-1-17, 72-1-25.

Descriptors: *Phosphorus, Reduction(Chemical), Lagoons, *Sewage lagoons, *Sewage treatment, Influent streams, *Coagulation, Lime, Methodology, Waste water treatment, *Ferric chloride, *Alum.

To reduce the effluent total phosphorus concentration below 1 mg per l from continuous discharge lagoons, ferric chloride, alum and lime were added continuously and singularly to the influent raw sewage at three waste stabilization ponds. During a two-year observation period, phosphorus and other parameters were monitored to assess the effect of each prime coagulant. A batch treatment with ferric chloride at one location quickly reduced the effluent phosphorus concentration below 1 mg per l, and the continuous addition of more ferric chloride to the raw sewage maintained the low phosphorus concentration during the entire program. The optimum dosage was found to be 20 mg per l as FE (+3). The continuous alum addition also reduced effluent total phosphorus concentration below 1 mg per l, and the dosage necessary was 225 mg per l alum. With both ferric chloride and alum there was no evidence of resolubilization of the precipitated phosphorus even under anaerobic conditions. With the lime, effluent total phosphorus concentration approached 1 mg per l, but was seldom below that value even with a dosage of 400 mg per l lime. The effluent phosphorus concentration was higher than in the 'treated' raw sewage, indicating that resolubilization did occur in the lagoon. As expected the lagoon pH was significantly increased. At all locations there was no appreciable change in any other effluent parameters. The sludge build-up during the experiments was monitored and did not appear to be excessive. Liquid ferric chloride and alum were readily used in this form of treatment. The hydrated lime as used here was labour intensive and caused numerous problems such as scaling and pump failure. (WATDOC)
W78-04345

RELIABILITY OF NITRIFICATION SYSTEMS WITH INTEGRATED PHOSPHORUS PRECIPITATION,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
P. M. Sutton, K. L. Murphy, B. E. Jank, and B. A. Managhan.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 64, 1977. 115 p, 21 fig, 11 tab, 26 ref, 3 append. 75-3-21.

Descriptors: *Nitrification, Effluents, *Waste water treatment, *Industrial wastes, *Phosphorus, Chemical precipitation, Alkalinity, Sludge, Model studies, *Steady flow conditions, *Non-steady flow conditions.

The desire to produce high quality effluents for municipal wastewater treatment plants has led to increasingly stringent limitations on the discharge of phosphorus and ammonia-nitrogen. The addition of iron or aluminum salts to a nitrifying activated sludge plant represents an economical method for phosphorus and nitrogen control. In this study, the effects of metal ion addition on nitrification were assessed by parallel operation of combined and separate sludge carbon removal-nitrification systems with and without chemical addition for phosphorus removal. Paired data analyses indicated little or no effect on filterable total Kjeldahl nitrogen (TKN) removal and nitrate production. Significant increases in alkalinity consumption and sludge production due to addition of Ae(+3) and Al(+3) were observed, and the results were compared to theoretical values. The capacity of nitrifying activated sludge system to meet effluent variability criteria was determined by parallel operation of combined sludge systems under various flow conditions at temperatures down to 5 degrees C with and without chemical addition for P removal. The solids retention time required to produce a consistently low effluent filterable TKN concentration will be affected by the magnitude and variability of the influent filterable TKN loading under steady or variable flow conditions. The results indicate that combined sludge systems designed to operate at high solids retention times can produce an effluent filterable TKN concentration of less than 2.5 mg per l 90 percent of the time at wastewater temperatures as low as 5 degrees C. (WATDOC)
W78-04346

DEMONSTRATION OF THE 'CABOS' WASTEWATER TREATMENT SYSTEM FOR VESSELS (1975-77),
Ontario Research Foundation, Sheridan Park.
V. Pancuska, and D. K. Smith.
Canada/United States Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Technology Development Report No. EPS 4-WP-77-6, November, 1977. 51 p, 6 fig, 5 tab, 3 append.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, Ships, Water pollution sources, Carbon, Adsorption, Filtration, Ozone, Disinfection, Laboratory tests, Effluents, *Sewage flow equalization, Bio-oxidation, Clarification.

'CABOS' is a new, modified biological sewage treatment system developed as part of the Government of Canada's vessel waste program under the 1972 Canada-U.S. Agreement on Great Lakes Water Quality. This report describes evaluation of the first prototype system during the 1975 shipping season aboard the SS John A. France, a bulk carrier owned and operated by Scott Misener Steamships Limited. The system included sewage flow equalization, carbon adsorption, bio-oxidation, clarification, filtration and ozone disinfection. The average effluent quality during the various testing periods under different loading conditions ranged from 6 to 25 mg per l BOD5 and from 5 to 13 mg per l SS. This was well within the prescribed limits of the new Great Lakes Sewage Pollution Prevention Regulations, which specify 50 mg per l BOD5 and 50 mg per l SS. This intense testing program, carried out by the Ontario Research Foundation (ORF), was followed in 1976 by routine operation by the ship's crew with minimum ORF supervision and sampling. During 1976, ORF investigated a suitable, automatic effluent quality monitoring system as required by the Canada Shipping Act. The efforts of ORF to select, procure and laboratory test suitable effluent monitoring equipment are also described in this report. Finally, some information is presented on the second prototype which will be further modified in the first production model for official land testing and approval as required under the Regulations. (WATDOC)
W78-04347

NITRILOTRIACETIC ACID (NTA) IN THE CANADIAN ENVIRONMENT,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5B.
W78-04350

REPORT OF THE LAND DISPOSAL OF SLUDGE SUBCOMMITTEE PROJECTS CONDUCTED 1971 - 1978,
For primary bibliographic entry see Field 5E.
W78-04351

HEATED DISCHARGE CONTROL AND MANAGEMENT ALTERNATIVES SMALL WATER BODIES AND RIVERS.
MacLaren (James F.) Ltd., Toronto (Ontario).
Water Pollution Control Directorate, Fisheries and Environment Canada, Ottawa, Canada, Economic and Technical Review No EPS 3-WP-77-13, October, 1977. 285 p, 57 fig, 8 tab, 4 append.

Descriptors: *Heated water, *Hydrothermal studies, *Rivers, Control, *Management, Biology, Effluents, Coolants, Cooling, Methodology, Thermal conductivity, Heat balance, Heat transfer, Stratification, *Thermal pollution, *Nonstratified water bodies, *Stratified water bodies, *Waste heat disposal.

Basic concepts of waste heat management on shallow and deep small water bodies and rivers are reviewed and examples are given. This study defines a small water body as a body in which the far field hydrothermal effects of a heated discharge can be detected in a major portion or practically all of the water body. Environmental effects due to warming of a small natural water body are consequently not limited to the immediate area of the outfall. The report divides small water bodies into three categories: rivers, nonstratified water bodies, and stratified water bodies. Management and control alternatives for each category are discussed, as well as the biological effects of various cooling systems, and methods for prediction and thermal modelling. Emphasis is placed on the significance of site-specific variations and the necessity for consideration of all alternatives before selection of a cooling system for a particular site. (WATDOC)
W78-04353

DEVELOPMENT OF PREDICTION MODELS FOR CHEMICAL PHOSPHORUS REMOVAL, VOLUME 1,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
B. P. Prested, E. E. Shannon, and R. J. Rush.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No 68, 1977. 52 p, 6 fig, 6 tab, 9 ref, 3 append. 73-3-9.

Descriptors: *Phorphorus removal, *Chemical reactions, *Model studies, Analysis, Water treatment, Forecasting, Detergents, Waste water treatment, Costs, Data collections, *Performance, *Jar test predictions, Full scale performance.

This project was initiated to establish a data bank of phosphorus removal treatability study results. The jar test and full scale treatability data were analyzed to obtain trends, cost data and other information that may prove beneficial in subsequent stages of the Canada-Ontario research program or

similar programs. The accuracy of jar tests in predicting full scale chemical dosage requirements was assessed. Some simple and useful regression equations relating chemical dosage to wastewater phosphorus levels were derived. The effect of the Canadian requirements to limit the phosphorus content of laundry detergents on wastewater phosphorus levels (20 percent reduction) and on chemical phosphorus removal programs are also discussed. (WATDOC)
W78-04354

STORAGE FOR STORM WATER QUALITY CONTROL - MEADOWVALE TEST SITE STUDY,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04357

REUSE OF WASTE S02 AND PHOSPHATE SEWAGE SLUDGES BY SOLIDIFICATION WITH LIME AND FLY ASH.
Acres Consulting Services Ltd., Niagara Falls (Ontario).
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 69, 1977. 22 p, 9 fig, 5 tab, 3 ref.

Descriptors: *Sewage sludge, *Sludge disposal, Wastes, *Waste treatment, *Waste storage, *Phosphates, Lime, Fly ash, Landfills, Land use, Land management, Recycling, Sulfur dioxide, *Solidification.

The phosphate-bearing sewage sludge disposal problem is becoming more acute each year. Not only are sludge volumes increasing, but disposal methods are becoming more expensive, in part because suitable landfill sites within easy hauling distance are being exhausted. These landfilled sludges are difficult to consolidate sufficiently for future use as building lots, thus reducing land use values. New, less expensive ways of disposing of phosphate-bearing sewage sludge are, therefore, urgently required. The laboratory phase of this research work indicates the feasibility of mixing sewage sludge with certain other waste ingredients to form a self-setting mix which consolidates well and is capable of long term retention of the phosphates in a cementing matrix. The mix ingredients consisted of fly ash and S02 sludges from coal burning thermal power plants and spent acids from industrial processes. Hence, several waste disposal problems may be solved simultaneouly. The only commercial commodity required for the process is lime which is easily obtainable and relatively inexpensive. The sludge per fly ash mixture can be produced either as a compactible mix or a liquid slurry. The compactible mix is an excellent base material for road and parking lot construction and could supplement rapidly depleting deposits of natural sand and gravel. The liquid slurry could be piped to landfill sites where it should set-up and gain sufficient strength so that these areas could be used as building sites. The cementing matrix, when mixed with as much as 6 percent dry phosphate-bearing sewage sludge, will have adequate strength for highly loaded (greater than 450 psi) landfill. (WATDOC)
W78-04360

CHEMICAL SEWAGE SLUDGE DISPOSAL ON LAND (LYSIMETER STUDIES) VOLUME 1,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5E.
W78-04361

SCAVENGING AND FLOCCULATION OF METAL-BEARING WASTEWATERS USING POLYELECTROLYTES,
McMaster Univ., Hamilton (Ontario); and Department of the Environment, Burlington (Ontario). Wastewater Technology Centre.
P. M. Huck, K. L. Murphy, and B. P. LeClair.
Technology Development Report EPS 4-WP-77-7, November, 1977. 98 p, 13 fig, 25 tab, 47 ref, append.

Descriptors: *Cleaning, *Flocculation, *Metals, Physical properties, *Drainage water, *Polyelectrolytes, Polymers, Mine drainage, Copper, Zinc, Heavy metals, Alkalis(Bases), Variability, Model studies, *Empirical modelling, *Mechanistic modelling.

This study determined optimum conditions for the use of polymers in flocculation of metal hydroxides present in neutralized mine drainage. Using the criterion of supernatant particulate metal concentration following flocculation and settling, optimum polymer properties and mixing conditions were obtained for both strong and weal simulated minewaters containing iron. It was shown that these conditions also provided minimum metal residuals (less than 0.3 mg per l) for simulated minewaters containing copper or zinc. For two-metal systems, the residual particulate metal concentrations achieved were lower than for the corresponding single-metal systems. Near the optimum, mixing conditions were more important than polymer properties. Optimum mixing times decreased greatly as minewater strength increased, as would be expected from kinetic considerations. Optimum mixing speeds increased moderately with increasing initial metal concentration, probably because of a corresponding increase in floc strength. Polymer molecular weight had no effect over the range investigated. The polymer degree of hydrolysis was unimportant in the range from 2 to 35 percent for the three metals at various initial concentrations. The optimum polymer dosage was not narrowly defined, but could be related to the minewater strength as 1.7 times 0.001 the initial metal concentration. Experiments performed to determine the best kinetic model for the process demonstrated that it could not be represented by a simple aggregation model, and that none of the available models incorporating floc breakup were adequate. A new model was proposed which incorporated for the first time the decrease in the aggregation rate with time. (WATDOC)
W78-04362

WASTEWATER USER CHARGES AND INDUSTRIAL COST RECOVERY: GUIDELINES AND EXAMPLES,
Department of Fisheries and Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W78-04364

CONSERVATION OF WATER, CHEMICALS, AND ENERGY IN DYEING NYLON CARPET,
Georgia Inst. of Tech. Atlanta. School of Textile Engineering.
For primary bibliographic entry see Field 3E.
W78-04370

ADAPTATION OF ACTIVATED SLUDGE FOR CYANIDE, (IN JAPANESE),
Hyogo Prefecture Environmental Science Inst., Kobe (Japan).
M. Furuki, and H. Kitamura.
Hakkokogaku Kaishi, Vol. 55, No. 5, p 269-275, 1977. 10 fig, 11 ref.

Descriptors: *Activated sludge, *Nitrogen compounds, Toxicity, *Inhibitors, *Sludge treatment, Resistance, Chemical wastes, Analytical techniques, Waste water treatment, *Cyanide.

Laboratory studies with the two-stage activated sludge process were used to examine the acclimation of activated sludge in the second aeration tank to cyanide in waste water. Reversible substrate inhibition in the second aeration tank was attributed to the presence of cyanide. Activated sludge which had been previously acclimated to higher concentrations of cyanide was more effective in cyanide degradation. Increasing the cyanide load to the aeration tank also increased the degree of cyanide removal. The extent of respiration inhibition by cyanide was counteracted by previous acclimation of the activated sludge to higher concentrations of cyanide. (Schulz-FIRL)
W78-04375

POTTERY EFFLUENTS AND THE WATER AUTHORITY,
Severn-Trent Water Authority, Birmingham (England).
K. Parsons, and N. Harkness.
Transactions and Journal of the British Ceramic Society, Vol. 76, No. 5, p 11-13, 1977.

Descriptors: *Sewerage, *Suspended solids, *Pollution taxes(Charges), *Sampling, *Industrial wastes, Clays, Costs, Monitoring, Municipal wastes, Foreign countries, Waste water disposal, Waste water treatment.

In England, the discharge of industrial effluents is regulated by the Drainage of Trade Premises Act of 1937 and the Public Health Act of 1961. The 1961 act placed the responsibility of regulation on local authorities. A series of agreements on charging, effluent quality, and treatment and disposal standards for industries in the Stoke-on-Trent area resulted from the 1961 act. Since 1974, taxation for the discharge of industrial effluents into the Severn-Trent municipal sewer system has been based on a formula which accounts for the volume, COD, and suspended solids level of the effluent. The charge is levied according to results from analyses of composite samples taken at least 12 times per year. The Strongford sewage treatment plant which serves the Stoke-on-Trent area utilizes the activated sludge process, anaerobic digestion, filtration, and chemical conditioning for the combined municipal and industrial wastes. In an effort to limit clay deposition in the area's sewers, suspended solids standards have been set for effluents from local ceramic industries. (Schulz-FIRL)
W78-04377

PUTTING ACTIVATED CARBON IN PERSPECTIVE TO 1983 GUIDELINES,
Engineering Science, Inc., Austin, TX.
For primary bibliographic entry see Field 5G.
W78-04378

SORTING THE CHEMICAL WHEAT FROM THE CHAFF.
Manufacturing Chemist and Aerosol News, Vol. 48, No. 10, p 27-36, 1977. 13 fig.

Descriptors: *Filtration, *Filters, *Equipment, *Chemical wastes, *Industrial wastes, Centrifugation, Separation techniques, Porous media, Dewatering, Waste water treatment.

The latest developments in filtration equipment are examined with particular reference to the pharmaceutical and cosmetic sectors of the chemical industry. Filter selection is generally based on the size of particle and quantity of material retained by the medium, the permeability of the clean medium, and the liquid flow rate. Filter presses, centrifugal filtration, rotary vacuum filters, pressure leaf filtration, on-line filtration, tube filtration, sterilizing filtration, membrane filtration, ultrafiltration, and laboratory units are discussed in detail. Sieves, screens, separators and associated equipment are also considered. (Baker-FIRL)
W78-04379

THE FUTURE FOR SILICONES.
International Dyer and Textile Printer, Vol. 158, No. 8, p 375-377, October, 1977. 2 fig.

Descriptors: *Chemical wastes, *Acidic water, *Chemical industry, *Neutralization, *Treatment facilities, Industrial plants, Europe, Technology, Filters, Industrial wastes, Waste water treatment, Waste water disposal, *Silicone manufacture.

The Dow Corning silicone manufacturing plant at Barry, Wales, includes chemical processing units using advanced technology, safety services, modern waste water treatment lagoons, and in-plant control. The most important products manufactured at Barry are dimethyl dichlorosilanes. Environmental protection expenditures amount to about 10% of the total capital outlay. The sophisticated waste water treatment system can handle up to 30,000 gal/hr of raw effluent and will be able to treat the additional waste from a five-fold increase in production of silicone. Disposal of dilute hydrochloric acid mixed with some sulfuric comprises the main effluent problem. The treatment system was built in conjunction with the Welsh National Water Authority. The first stage skims off immiscible solvents and debris for incineration. The remaining acid waste water then enters two equalization ponds. The acids are then neutralized by lime addition. The resulting solid calcium sulfate is removed by settling and dewatering and then transported to a landfill. Sand filters then remove any remaining fine solids. Much of the water is recycled; any surplus is discharged to the river. Waste chlorosilanes are hydrolized using recycled water; the resulting hydrochloric acid is returned to the treatment plant. (Snyder-FIRL)
W78-04380

HEALTH AND ENVIRONMENTAL PROTECTION IN A DIAMOND POLISHING FACTORY,
Drukker (D.) and Zn N. V., Amsterdam (Netherlands).
G. Meijer.
Industrial Diamond Review, p 348, October, 1977.

Descriptors: *Neutralization, *Lead, *Filtration, *Industrial wastes, *Treatment facilities, Water reuse, Chemical wastes, Waste water treatment.

Waste water treatment facilities at the Drukker-Dumig Diamond Factory in Cuyk, Holland, were designed to accomodate the heavy metals and acids generated during the manufacture of polished gemstones and industrial diamond products. Accumulated lead and abrasive particles in waste water from the scouring process had been removed in four settling tanks. A filter system, manufactured by Golden Super B. V., was added to further reduce the lead content of the waste water. The system included 50-, 20-, and 10-micron filters which produced a lead-free effluent. The scouring process was later modified by eliminating the need for lead reconditioning of the cast iron polishing scaives to prevent the accumulation of lead in scouring waste water. Strong acids and hydroxides from diamond cleaning processes are neutralized before discharge to the municipal sewer system. Installation of the 10,000-Dutch guilder waste treatment facilities at Drukker-Dumig has reduced the annual waste water treatment surcharge levied on the factory from 10,000 to 195 guilders. (Schulz-FIRL)
W78-04381

PILOT DEMONSTRATION OF RENOVATION AND REUSE OF WASTEWATERS FROM ORGANIC CHEMICAL MANUFACTURING.
Union Carbide Corp., South Charleston, WV.
M. Scherm, and C. T. Lawson.
Industrial Water Engineering, Vol 14, No 6, p 16-22, October-November, 1977. 7 tab, 3 fig.

Descriptors: *Water reuse, *Tertiary treatment, *Chemical wastes, *Industrial water, *Industrial wastes, Pilot plants, Coagulation, Filters, Activated carbon, Suspended solids, Waste water treatment.

A study was conducted by Union Carbide Inc. to examine the costs and water quality resulting from a best state-of-the-art process for treating waste water from the Union Carbide Caribe organic chemical manufacturing complex in Puerto Rico. The effects of residual contaminants in renovated water used as boiler or cooling tower makeup were also examined. A pilot-scale plant was designed to continuously treat 5 gpm of biological effluent from a 7.5-day detention time activated sludge pilot plant which treated pH-adjusted, clarified and equalized waste water from the chemical manufacturing complex. Tertiary treatment included suspended solids removal by coagulation/flocculation, followed by a 2-stage tube clarifier, a multi-media filter, granular activated adsorption columns, and multi-media pressure filter for final suspended solids removal. The tertiary treatment plant produced water of a quality sufficient for use as high-pressure boiler feedwater. Water of a high enough quality for use as cycle cooling water was produced with fewer unit operations. The use of renovated waste water as cooling or makeup water required heat exchangers to be constructed of A-249 stainless steel to maintain satisfactory corrosion and heat transfer characteristics. Treatment costs at a 67% water recovery rate were projected at $7.50/1,000 gal. (Schulz-FIRL)
W78-04382

A WASTE STREAM MANAGEMENT SYSTEM,
Dow Chemical Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W78-04383

PACKAGE PLANT FOR SLUDGE DISPOSAL.
For primary bibliographic entry see Field 5E.
W78-04384

ENVIRONMENTAL TRACE ANALYSIS OF ORGANICS IN WASTE WATER BY GLASS CAPILLARY COLUMN CHROMATOGRAPHY AND ANCILLARY TECHNIQUES,
Colorado Univ., Boulder. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-04387

GIANT MOTIONLESS MIXER MADE FROM FR POLYESTER FOR WASTEWATER PH CONTROL.
Chemical processing, Vol. 41, No. 1, p 106, January, 1978.

Descriptors: Chemical industry, *Neutralization, *Sulfur compounds, *Mixing, *Chemical wastes, Industrial wastes, Waste water treatment, Acid-base equilibrium, Effluents, Hydrogen ion concentration.

A pH adjusting, corrosion-resistant mixer has been developed by Kenics Corp. of North Andover, Massachusetts, for chemical waste treatment. The 27-ft long mixer has a 54-in diameter and an internal, immobile double helix with alternating spirals along the edge to change the flow direction during mixing. A built-in injector adds sulfuric acid to neutralize an effluent flow of 25,000 gal/min. The unit is constructed of fiberglass-reinforced polyester resin to prevent corrosion by the chemical-containing wastes. The hand-laid helices, also composed of fiberglass, are resistant to separation due to thermal expansion; the entire unit was constructed to withstand the hydraulic pressures of a large effluent flow. A 3,000 lb unit has been installed at the FMC Corporation chemical plant is South Charleston, West Virginia. (Lisk-FIRL)
W78-04388

THE TREATMENT PLANT AND INTRAPLANT MEASURES IN THE WASTE WATER TREATMENT OF BASF (DIE KLAERANLAGE DER BASF UND FLANKIERENDE MASSNAHMEN BEI DEN BETRIEBEN),
H. Enselhard, and K. G. Malle.
Forum Staedte Hygiene, Vol. 28, No. 11, p 305-310, November, 1977. 9 fig, 2 ref.

Descriptors: Chemical industry, *Chemical wastes, *Organic wastes, *Sulfur compounds, *Biochemical oxygen demand, Chemical oxygen demand, Carbon, Municipal wastes, *Waste water treatment, *Treatment facilities, Industrial wastes.

Additional treatment measures for waste water discharged into the Rhine River by BASF, the largest integrated chemical plant in Europe, were examined. The removal of nondegradable waste unaffected by biological treatment has been attempted within the treatment facilities of the chemical plant. Methods and facilities for the effective treatment of residual sulfuric acid and waste water containing high organic concentrations have been implemented. A mechanical-biological treatment plant has been purifying waste water from both the chemical plant and the city of Ludwigshafen, West Germany, since 1974. The chemical plant produces a daily waste water flow of 500,000 cu m with 350 tons BOD, while the municipal daily flow averages 50,000 cu m with 18 tons BOD. The BOD content in waste water discharged into the Rhine by the chemical plant in 1976 was decreased by more than 95%, reduced from more than 250 tons/day to less than 25 tons/day. Similarly, COD decreased by 88%, from over 600 tons/day to about 125 tons/day. Estimated construction costs of the treatment facilities totalled 450 million Deutsche-Marks, and operating costs including depreciation in 1975 were estimated at 114 million Deutsche-Marks. (Lisk-FIRL)
W78-04390

PROCESS FOR THE PURIFICATION OF WASTE WATERS.
Australian Patent 487,459. Issued October 27, 1977. The Australian Official Journal of Patents, Trademarks, and Designs, Vol 47, No 40, p 3621, October, 1977.

Descriptors: *Food processing industry, *Ion exchange, *Resins, *Patents, *Separation techniques, Cathodes, Electrochemistry, Organic wastes, Industrial wastes, Waste water treatment.

A patent has been issued for a treatment process that is applicable to waste water from the regeneration of ion exchange resins used to purify sugar liquors. The waste water produced during the regeneration of an anionic resin is passed to the anodic zone of an electrolytic cell. The electrolytic cell is equipped with a cation-selective ion exchange membrane. A solution which is concentrated with respect to the regenerating anion is recovered from the anodic section of the cell. The solution obtained from the cathiodic region of the cell is essentially free of organic compounds. During treatment of waste water from the regeneration of a cationic resin, the solution is fed to the cathodic zone of an electrolytic cell which has been equipped with an anion-selective ion exchange membrane. In this case, the solution in the anodic compartment is concentrated with respect to organic compounds. The two concentrated solutions are combined and then fed to an evaporator for recovery of the organic compounds in a dry form. (Schulz-FIRL)
W78-04391

EFFLUENT TREATMENT IN MEAT AND POULTRY PROCESSING INDUSTRIES,
Alwatech Ltd., High Wycombe (England).
D. Hopwood.
Process Biochemistry, Vol 12, No 8, p 5-8, 44, 46, October, 1977. 1 fig, 4 tab, 29 ref.

Descriptors: *Food processing industry, *Poultry, *Biochemical oxygen demand, *Industrial wastes, Effluents, Activated sludge, Biological treatment, Filtration, Sludge disposal, Costs, Waste water treatment, Waste water disposal.

The wide range of processes available for the treatment of meat and poultry processing wastewaters are discussed with respect to the importance of choosing the system best suited to each individual establishment in practical and economic terms. Because of their biodegradable and non-toxic nature, meat and poultry wastewaters are not difficult to treat. The difficulty lies not in finding a technically viable system, but in finding the most practical and economical system for a given situation. Topics discussed in the paper include: preliminary treatment of the effluent, land application, lagooning, biological filtration, activated sludge processes, anaerobic biological treatment, chemical precipitation, protein recovery by precipitation with lignosulfonic acid, protein recovery by adsorption, water resue, sludge disposal, and economic considerations. (Baker-FIRL)
W78-04393

FOOD FROM WASTE.
For primary bibliographic entry see Field 5E.
W78-04394

RECOVERY OF WATER FOR RE-USE.
Food Manufacture, Vol 52, No 10, p 39, October, 1977.

Descriptors: *Water reuse, *Recycling, *Effluents, *Sludge treatment, *Industrial wastes, Water consumption, Separation techniques, Waste water treatment.

Industrial water reuse was discussed in one of a series of papers presented at the Food Manufacture conference, held in October 1977, in London, England. Water consumption can be lowered in industrial operations by reductions in water intake, leakage, and product wasting. Various process modifications to reduce overall water consumption are possible. Waste water treatment usually involves some configuration of equalization, pretreatment, aerobic biological treatment, or anerobic biological treatment. The sale of dried sludge from the food processing industry may be feasible in a large-scale operation. (Baker-FIRL)
W78-04395

TECHNIQUES FOR DAIRY WASTE RECOVERY.
Food Manufacture, Vol 52, No 10, p 41, October, 1977.

Descriptors: *Dairy industry, *Milk, *Industrial wastes, *Recycling, *Effluents, Food processing industry, Separation techniques, Waste water treatment.

Techniques for recovering milk solids from wastes were discussed in one of a series of papers presented at the Food Manufacture conference, held in October of 1977 in London, England. The pollutant load in dairy waste is considerable and the cost of treatment can be high. To reduce waste water treatment costs, spillages must be reduced and all possible milk solids recovered. Milk spillage caused by overflow and cleaning operations produces approximately 50% of the total quantity of waste generated during dairy operations; whey spillage, cheese scaping wastes, separator sludge, and milk solids comprise the remainder. The sale of byproducts from dairy waste treatment, even at a loss, is considered advantageous because of the reduction in pollutant discharge. (Baker-FIRL)
W78-04396

FLOCCULATION WITH FLOTATION.
Effluent and Water Treatment Journal, Vol 17, No 11, p 607, November, 1977. 1 fig.

Descriptors: *Flocculation, *Food processing, *Oil industry, *Pulp and paper industry, *Separation techniques, Waste water treatment, Industrial wastes, Sludge treatment, Equipment, Design data, *Flotation.

Flockation, a combination flocculation-flotation treatment system for the removal of suspended solids from waste water, is discussed. The system requires less space than sedimentation processes and reduced flocculation time from 2-3 hrs to 35-40 min. Waste water is treated with a flocculant and sent through a series of mixing and flocculation chambers. The effluent is then passed into a flotation tank and is treated with air-injected water. The floc adheres to fine air bubbles and rises to the surface where it is removed continuously by scrapers or rotation rollers. The Flockation system has been shown effective in the removal of metals from plating and finishing industries wastes, fats and proteins from food processing wastes, and fiber from paper industry wastes. The system thickens the sludge to 12% of its original volume. (Lisk-FIRL)
W78-04397

FILTERING VIBRATORY-DEBURRING EFFLUENT.
Machinery and Production Engineering, Vol 131, No 3383, p 381, October, 1977.

Descriptors: *Filters, *Suspended solids, *Filtration, *Metals, *Treatment facilities, Industrial wastes, Water resuse, Equipment, Waste water treatment.

The Rank-Xeroz Ltd. factory in Mitcheldean, England, has installed a Carlson 60-cm plate and frame filter unit to treat waste water from the vibratory deburring of aluminum alloy castings. The filter, which has been used in the past for distillery wastes, has effectively reduced the suspended solids level in the effluent from 2800 to 11 mg/liter. The system was installed to comply with local water authority regulations which included a maximum suspended solids standard of 400 mg/liter in waste water discharged to the sewer system. The high reduction in suspended solids has allowed the reuse of treated waste water in factory operations. The filter unit was suppied by Carlson-Ford Ltd. of Ashton-under-Lyme, Lancastershire, England. (Schulz-FIRL)
W78-04398

EFFLUENT FILTRATION PLANT AT RANK XEROX, MITCHELDEAN WORKS,
Rank Xerox Ltd., Gloucestershire (England).
M. G. Carter.
Effluent and Water Treatment Journal, Vol 17, No 2, p 536-539, October, 1977. 1 tab, 1 fig.

Descriptors: *Filtration, *Suspended solids, *Industrial wastes, *Filters, *Equipment, Treatment facilities, Separation techniques, Waste water treatment.

Waste water treatment at the Rank Xerox Ltd. plant in Mitcheldean, England, is described. Effluents discharged from the vibratory deburring of aluminum castings must meet a 400 mg/liter suspended solids maximum set by the Severn-Trent Water Authority. Partial settling in a catchment pit had been previously used to reduce the suspended solids from 2800 to 522 mg/liter. In 1976, the catchment pits were replaced by a standard Carlson-Ford 60 cm Kieselguhr filter equipped with 20 plates and frames. Grade W2 pads and B-WS facing papers are used to remove most of the particulate matter and complete the final polishing. Clarcel Flo CR is used as a filter aid to prolong the life of the filter. The dispensing system has been modified so that the filter aid is added directly to the collection sump. Suspended solids levels in effluents discharged from Rank Xerox are now less than 5 mg/liter. (Schulz-FIRL)
W78-04399

REVERSE OSMOSIS PROVIDES REUSABLE WATER FROM ELECTRONICS WASTE,
IBM Corp., Manassas, VA.
C. Caprio, M. D. Beasley, and L. Luttinger.
Industrial Water Engineering, Vol 14, No 6, p 24-30, October-November, 1977. 4 tab, 9 fig.

Descriptors: *Reverse osmosis, *Membrane processes, *Separation techniques, *Acidic water, *Industrial wastes, Desalination, Operation and maintenance, Water reuse, Recycling, Waste water treatment.

Reverse osmosis (RO) has been used at the IBM facility in Manassas, Virginia, to provide reusable water from electronics waste. Pilot-scale, two-stage hollow fiber and spiral wound RO units, manufactured by the Permutit Corp. of Princeton, New Jersey, were tested with dilute acid wastes from IBM. A hollow fiber (RO) system was selected in 1977 for waste water recycling, with provisions for maintaining the Fouling Index (FI) below 3.0 and cleaning the permeators whenever signs of plugging or fouling occurred. The pretreatment quality of the dilute acid waste was to be monitored with FI measurements. The maintenance of an acceptable FI was to involve more careful control of the in-line coagulation via zeta potential control of the polyelectrolyte. The flexible system was designed to separate the dilute acid waste and raw municipal water if fouling tendencies became prevalent. The final choice of membrane configuration will be based on several factors, including: initial system cost, additional capital and operating costs associated with pretreatment, membrane cleaning and replacement requirements, and compatibility with existing equipment and processes. A target date of September 1, 1977, was set for operational status for the first phase of the recycling program. (Baker-FIRL)
W78-04400

METHOD AND DEVICE FOR SLUDGE TREATMENT.
Australian Patent 487,041. Issued October 6, 1977.
Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 47, No. 37, p 3386, October, 1977.

Descriptors: *Sludge treatment, *Alkalis(Bases), *Oxides, *Patents, *Dewatering, Sludge disposal, Industrial wastes, Waste water treatment, Sanitary engineering.

A process for the conversion of metal hydroxides in sludge to metal oxides has been patented. The sludge is first dewatered to the point where it becomes thixotropic. In this thixotropic state, the sludge is treated to reduce it to a thin layer or film. A drying process further reduces the film or layer of metal hydroxide to the form of scales or grains. These metal hydroxide scales or grans then undergo calcination and the crystal water is removed, converting the residual scales or grain into metal oxide poweder. This powder, which is non-toxic, can be properly disposed of without adverse effects on the environment. (Lisk-FIRL)
W78-04401

POLYETHYLENE PIPELINE CARRIES TREATED BALLAST FOR UNDERWATER DISCHARGE.
For primary bibliographic entry see Field 5E.
W78-04402

PULP AND PAPER MILL SLUDGE IN FIBRE BOARD,
Norwegian Pulp and Paper Research Inst., Oslo.
For primary bibliographic entry see Field 5E.

W78-04404

THREE EVAPORATOR FLOW DIAGRAMS THAT ADAPT TO CURRENT ENERGY COSTS AND EMISSION REQUIREMENTS,
Rosenblad Corp., Princeton, NJ.
A. E. Rosenblad.
AIChE Symposium Series, Vol. 72, No. 157, p 83-88, 1976. 10 fig, 3 tab, 3 ref.

Descriptors: *Pulp and paper industry, *Water consumption, *Energy, *Costs, *Separation techniques, Evaporation, Industrial wastes, Heat transfer, Waste water treatment.

Flow diagrams are presented for three evaporators which adapt to current energy costs and emission requirements for odor control in kraft mill operations. These approaches for the concentration of black liquor incorporate features that reduce both operating costs and secondary treatment requirements for the evaporator condensates. The vapor recompression cycle and heat releases from both continuous and batch digesters are used to reduce operating costs. Countercurrent steam and condensate flows are used in conjunction with large venting rates to provide stripped condensate from the bulk of evaporation, leaving only a very small amount of condensate requiring secondary treatment. Three specific cases are discussed with respect to steps taken to meet pollution control goals. In the first case the objective was to increase the total evaporation capacity in a kraft mill and clean up the evaporator condensates. A second case focused on providing an economical heat balance for new kraft mills using Kamyr continuous digesters. In the third example the heat releases from batch digesters were used to reduce steam consumption and to separate evaporator condensates. (Baker-FIRL)
W78-04405

TWO-STAGE ACTIVATED SLUDGE BETTER THAN SINGLE FOR TOXICITY REDUCTION.
Canadian Pulp and Paper Industry, Vol. 30, No. 16, p 28-29, November, 1977. 1 fig, 2 tab.

Descriptors: *Pulp and paper industry, *Activated sludge, *Toxicity, *Bioassay, *Pilot plants, Industrial wastes, Biochemical oxygen demand, Pulp wastes, Biological treatment, Waste water treatment.

A two-stage biological system, manufactured by Cellulose Attisholt AG of Luterbach, Switzerland, was tested for the treatment of effluents from kraft pulp and paper mills. The specific objectives of the study were to determine the capabilities of a two-stage sludge system in reducing the acute toxicity of kraft mill effluents and to compare its efficiency with a conventional single-stage activated sludge plant for the removal of BOD and toxicity. The variability in toxicity of treated and untreated kraft bleachery effluent was investigated with respect to time and treatment process operation. Extreme fluctuations in median survival time of rainbow trout were observed for hourly samples collected over a 24-hour period. The studies concluded that both the single- and two-stage activated sludge systems were incapable of reducing toxicity to a consistent level. (Baker-FIRL)
W78-04406

THE BUILDUP OF DISSOLVED ELECTROLYTES IN A CLOSED PAPER MILL SYSTEM,
Scott Paper Co., Philadelphia, PA.
S. D. Alexander, and R. J. Dobbins.
TAPPI, Vol. 60, No. 12, p 117-120, December, 1977. 2 fig, 10 ref.

Descriptors: *Water reuse, *Pulp and paper industry, Effluents, *Recycling, *Water quality, *Industrial water, Industrial wastes, Effluents, Waste water treatment, *Electrolytes.

The use of a closed mill water system is discussed as a means of pollution abatement for the pulp and paper industry. Closure of the paper mill water system eliminates the need for extensive secondary and tertiary water treatment facilities. However, closure may also allow the concentration of dissolved solids in mill water to be drastically increased through water reuse, possibly affecting water quality and paper properties. Theoretical considerations are used to demonstrate that, at complete closure, the concentration of dissolved solids in the headbox can be up to 160 times the level anticipated for a completely open mill. An enrichment factor is defined to express the chemical buildup in a paper mill water recycling system. Completely and partially soluble species, as well as those species which are preferentially adsorbed by the paper web, are incorporated by the enrichment factor. The use of the enrichment factor is detailed and verified with data from pilot studies at a 200 ton/day integrated groundwood pulp and paper mill. (Baker-FIRL)
W78-04407

POLLUTION CONTROL SEMINAR GETS RAVES FOR N.E. CLUB.
The Leather Manufacturer, Vol. 94, No. 12, p 9-10, December, 1977.

Descriptors: *Tannery wastes, *Treatment facilities, *Solid wastes, *Sulfides, *Suspended solids, Biochemical oxygen demand, Hydrogen sulfide, Waste disposal, Industrial wastes, Pollution abatement, Legal aspects, Waste water treatment.

Because disposal of solid wastes from tanneries may become legally or economically impossible, development of by-product technologies, such as energy recovery, fiber utilization, and protein/nitrogen utilization, is recommended. A recently-developed incineration process will generate energy and recover virtually all the chrome in tannery wastes, producing nitrate-rich ash containing no hexavalent chromium. Flow, suspended solids, BOD, and sulfide in waste water deserve more consideration by tanneries. A decrease in water usage is also recommended. Coagulation and flotation are generally more efficient than settling basins in removing suspended solids. The TNO Unhairing System uses no lime and minimizes water flow. Eliminating lime will not totally eliminate sulfide problems because organic sulfides are generated biologically. Sulfides may be removed by oxidation with air and a manganese sulfate catalyst or removed in the form of H2S by the addition of acid. The H2S is recovered for recycling. Process modifications as well as waste water treatment should be considered. Air pollutants from tanneries include hydrocarbons, sulfur oxides, and H2S. (Snyder-FIRL)
W78-04408

INCINERATION OF TANNERY WASTE,
Jones and Beach Engineers, Inc., Stratham, NH.
For primary bibliographic entry see Field 5E.
W78-04409

FUNDAMENTAL PRINCIPLES OF SLUDGE ANALYSIS (GRUNDLAGEN DER ANALYTIK VON SCHLAEMMEN),
For primary bibliographic entry see Field 5A.
W78-04410

PRECIPITATOR RECLAIMS WATER FROM WASTE STREAMS.
Chemical Engineering, Vol. 85, No. 1, p 41-42, January, 1978. 1 fig.

Descriptors: *Water reuse, *Chemical precipitation, Equipment, *Sulfur compounds, *Industrial wastes, Disinfection, Lime, Waste water treatment, *Chemical precipitation.

A precipitator has been manufactured by Precipitator, Inc., of Santa Fe Springs, California, for the reclamation of water from waste streams. The Lindman precipitator is a physical and chemical wastewater treatment system, using sulfur dioxide, iron, and lime in a continuous-flow process. The system is not affected by the presence of heavy metals or toxic organics. Test results indicate that it can significantly reduce total dissolved solids. The sterile products, clear water and sludge, can be used as soil conditioners or fuel. The workings of the system are described along with test results and operational data. Operating costs for the system are estimated at $0.21/1,000 gal of feed. (Baker-FIRL)
W78-04411

VALDEZ OUTFALL LINE IS EARTHQUAKE-PROOF.
For primary bibliographic entry see Field 5E.
W78-04413

TREATMENT OF ACID MINE DRAINAGE BY THE ALUMINA-LIME-SODA PROCESS,
Midwest Research Inst., Kansas City, MO.
J. W. Nebgen, D. F. Weatherman, M. Valentine, and E. P. Shea.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 930, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-206, September 1976. 105 p, 15 fig, 17 tab, 5 ref, 2 append.

Descriptors: *Acid mine water, *Mine drainage, *Chemical precipitation, *Treatment facilities, *Neutralization, Mine wastes, Lime, Industrial wastes, Waste water treatment, Waste water disposal, *Alumina-lime-soda process.

In the alumina-lime-soda process, water containing sulfate salts, such as acid mine drainage, is first contacted with sodium aluminate and lime to cause the precipitation of dissolved sulfate in the form of calcium sulfoaluminate. The resulting alkaline water is carbonated to remove excess hardness. A 190 liter/day bench-scale unit was operated at the Commonwealth of Pennsylvania's Acid Mine Drainage Research Facility in Hollywood, Pennsylvania, to provide experimental data for the design and construction of a demonstration plant. The treated water met drinking water specifications. The waste constituents were removed in the form of easily dewatered solids. The cost of sodium aluminate had the greatest influence on the economics of the process. The increased demand caused by widespread use of the process should generate increased interest in alternate sodium aluminate sources. Operating costs for treating acid mine drainage with 700 mg/liter acidity and a sulfate concentration of 750 mg/liter were estimated at $0.21-0.27/cu m. (Snyder-FIRL)
W78-04414

TREATMENT OF EFFLUENT WATERS FROM VEGETABLE OIL REFINING,
Archer Daniels Midland Co., Decatur, IL.
D. F. Gill, Jr, and J. C. Ielase.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 875, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2-76-294, December, 1976. 89 p, 24 fig, 22 tab, 3 ref, 3 append.

Descriptors: *Oilseed crops, *Industrial wastes, Pollutant identification, *Chemical precipitation, *Treatment facilities, Soybeans, Biochemical oxygen demand, Annual costs, Income, Waste water treatment.

The Archer Daniels Midland Company, Inc., operates a plant at Decatur, Illinois to extract and refine oil from seeds, primarily soybeans. The extraction plant produces 150,000 gpd of waste water; the refinery produces 134,000-183,000 gpd. A study was undertaken to identify the waste

streams, characterize the waste water, and determine and implement optimum treatment. Surface skimming as the only treatment resulted in an original BOD loading of 0.0135 kg/kg of oil processed. Refinery washwater was the largest source of BOD and fat; cooling tower blowdown and water from acidulation contributed smaller amounts. Pretreatment of the wash water by adding 0.25% calcium chloride and adjusting the pH to 5-6 was capable of reducing the overall BOD by 71%. Process modifications, increased production supervision, and a clarifier for controlling process upsets produced a further 50% reduction in BOD, bringing the waste strength to within municipal discharge limits. The annual operating cost for the system was $75,000; byproduct recovery revenues ranged $20,000-$180,000/yr. (Snyder-FIRL)
W78-04415

INDUSTRIAL WASTE AND PRETREATMENT IN THE BUFFALO MUNICIPAL SYSTEM,
McPhee, Smith, Rosenstein Engineers Buffalo, NY.
K. Peck, and J. C. Gorton, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 937, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-600/2-77-018, January 1977. 184 p, 19 fig, 30 tab, 31 ref, 3 append.

Descriptors: *Activated sludge, *Sewerage, *Pollutant identification, *Industrial wastes, *Municipal wastes, Biological treatment, Sewage treatment, Treatment facilities, Waste water treatment, Waste water disposal, New York, *Buffalo(NY).

The requirements and effects of combined industrial and domestic waste water treatment were investigated in Buffalo. Industrial users and types of discharges, as well as quality and quantity of waste water from 85 large industries in Buffalo and 79 other industries, were determined. Material balances were used to define the volume and waste characteristics of residential and industrial users and inflow/infiltration in Buffalo. A program for industrial waste control, including revised regulations for sewer use, a permit system, and a monitoring program, was developed. An ad valorem tax which was levied in conjunction with waste water service charges and surcharges for high strength industrial wastes was used to cover the cost of treatment. A 95,000 liter/day activated sludge pilot plant was used to evaluate the effects of industrial users on treatment processes and determine metal concentrations in the effluent and waste sludges. The sludge produced by sewage treatment in Buffalo could be disposed of by soil conditioning, landfill, or disposal with refuse. (Snyder-FIRL)
W78-04416

PROCEEDINGS OF THE SIXTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES, APRIL 9-11, 1975.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 360, Price codes: A21 in paper copy, A01 in microfiche. Report EPA-600/2-76-224, December 1976. 475 p, 140 fig, 88 tab, 108 ref.

Descriptors: *Food processing, *Industrial wastes, *Waste water treatment, *Waste water disposal, Canneries, Effluents, Recycling, Pollution abatement, Pilot plants, Treatment facilities, Sludge treatment, Sludge disposal.

The Sixth National Symposium on Food Processing Wastes, co-sponsored by the National Canners Association and the Wisconsin Canners and Freezers Association, was held in Madison, Wisconsin, on April 9-11, 1975. Twenty papers given at the symposium are presented, including various topics related to the waste treatment and disposal of cannery and meat packing wastes. Process modifications for the reduction of waste water volume and strength are described. (See W78-04418 thru W78-04431) (Schulz-FIRL)
W78-04417

INVESTIGATION OF AN ANAEROBIC-AEROBIC LAGOON SYSTEM TREATING POTATO PROCESSING WASTES,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
J. N. Dornbush, D. A. Rollag, and W. J. Trygstad.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 3-21, 3 fig, 3 tab, 5 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Potatoes, *Aeration, *Oxidation lagoons, *Treatment facilities, Aerated lagoons, Anaerobic conditions, Pilot plants, Organic wastes, Biochemical oxygen demand, Odor, Suspended solids, Industrial wastes, Waste water treatment.

The treatment efficiency of the potato processing waste treatment units at Midwest Foods Corporation in Clark, South Dakota, was investigated prior to the 1973-1974 processing season. The system included a 100,000 cu ft anaerobic lagoon, folowed by a 404,000 cu ft aerobic lagoon. The aerobic conditions in the aerated lagoon and stabilization pond indicated these units had recovered from previous overloading. The adoption of dry-caustic peeling and other water conservation practices reduced water usage from 3500 gal per ton of raw potatoes to approximately 813 gal. The anaerobic lagoon removed 74% of the BOD and 78% of the suspended solids (SS), despite an average BOD loading of 45.5 lbs/1000 cu ft/day, over three times higher than the design value. The anaerobic lagoon's styrofoam-straw cover maintained adequate temperatures in the lagoon and helped control odors. The BOD:N:P ratios indicated that the use of an anaerobic lagoon prior to aerobic treatment conserved inorganic nutrients. The aerated lagoon, operated well wihtin the BOD loading range, removed 82% of BOD and 68% of SS. The stabilization pond, operating at about 50% of its design BOD loading, removed 77% of BOD and 79% of SS. The treatment system as a whole removed 99% of BOD, 98.5% of SS, and 96.3% of COD. Silt which builds up in the anaerobic lagoon at a rate of 40.5 cu ft/operating day could eventually decrease its capacity. (See also W78-04417) (Snyder-FIRL)
W78-04418

UTILIZATION OF CHITOSAN FOR RECOVERY OF COAGULATED BY-PRODUCTS FROM FOOD PROCESSING WASTES AND TREATMENT SYSTEMS,
Georgia Univ., Experiment. Dept. of Food Science.
W. A. Bough, D. R. Landes, J. Miller, C. T. Young, and T. R. McWhorter.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 22-49, 6 fig, 8 tab, 29 ref. Report EPA-600/2-76-224.

Descriptors: *Canneries, *Activated sludge, *Polymers, *Coagulation, *Reclamation, Food processing industry, Byproducts, Feeds, Biological treatment, Industrial wastes, Waste water treatment.

Chitosan, manufactured from seafood wastes, is composed of glucosamine residues linked by beta, 1-4 glycosidic bonds. The use of coagulated byproducts from chitosan treatment for animal feeds has been considered by the food processing industry. Chitosan was evaluated for coagulation of activated sludge in pilot studies at a brewery and at a cannery processing pimentos, leafy greens, and grean beans. Activated sludge from the brewery clarifier was fed to a continuous centrifuge at a rate of 26-32 gpm. Chitosan treatment with a 3 rpm differential between the centrifuge bowl and sludge conveyor speeds resulted in 30.7% capture of suspended solids with polymer addition. A 22.4% capture was obtained without polymer addition. Total solids concentrations in the cannery waste sludge cake increased by 1% when chitosan was added. Fat, fiber, and ash in coagulated brewery sludge averaged 2.0, 6.6, and 16.1%, respecitvely. Protein concentrations were measured as 50.8% by Kjeldahl analysis and 28.5% by amino acid content. Coagulated solids from egg breaking wastes contained 4.9% ash, 39.4% fat, 45.6% protein by Kjeldahl analysis, and 41.8% protein by amino acid analysis. Rats fed less than 5% chitosan grew as well as those fed the control diet without added chitosan. (See also W78-04417) (Snyder-FIRL)
W78-04419

EGG BREAKING AND PROCESSING WASTES CONTROL AND TREATMENT,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
W. J. Jewell, W. Siderewicz, R. C. Loehr, R. R. Zall, and O. F. Johndrew, Jr.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 61-104, 15 fig, 9 tab, 12 ref. Report EPA 600/2-76-224.

Descriptors: *Food processing industry, *Biological treatment, *Pollutant identification, *Chemical oxygen demand, Activated sludge, Aerated lagoons, Anaerobic conditions, Industrial wastes, Waste water treatment, Waste water disposal.

Five egg-breaking facilities, three in New York State and one each in Georgia and Arkansas, were monitored to assess the effect of in-plant modifications to reduce waste quantities. The COD of the waste water exceeded 6000 mg/liter, and BOD was about 60% of the COD. Where in-plant waste management was inadequate, up to 15% of the egg product was lost to the sewer. In-plant modifications reduced BOD by an average of 50% and waste water volume by 24%. The additional product recovered through in-plant modifications to reduce waste was valued at $250-500/day for a medium sized facility, not including the savings from a reduction in waste treatment costs. Treatability studies were conducted on waste water from three egg-breaking plants in New York State, the largest of which had a total design waste flow under 200,000 gpd. A 20-liter reactor was used to simulate aerated lagoon treatment. Treatability was also evaluated with a 5.5-liter activated sludge reactor, followed by an 800 m/liter clarifier. The applicabilities of a rotating biological contactor and an anaerobic-aerobic lagoon series were also examined for egg-breaking wastes. The wastes responded favorably to biological treatment. Conventional processes, such as activated sludge and aerobic lagoons, did not reduce high concentrations of organic material to levels acceptable for direct discharge to surface waters. An anaerobic lagoon followed by an aerobic lagoon had an overall COD removal efficiency of over 98%. (See also W78-04417) (Snyder-FIRL)
W78-04420

TREATMENT CAPABILITIES OF AN EXTENDED AERATION SYSTEM FOLLOWING ANAEROBIC LAGOONS TREATING MEAT PACKING WASTES,
Balyardt and Wells, Omaha, NE.
W. J. Wells, Jr, P. B. Wells, and D. D. Alleman.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 131-150, 8 fig. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Treatment facilities, *Aeration, *Anaerobic conditions, *Lagoons, Biological treatment, Biochemical oxygen demand, Organic wastes, Industrial wastes, Odor, Waste water treatment.

The Monfort Packing Company in Greely, Colorado, has used anaerobic lagoons, extended aeration, and two polishing ponds to treat 2.67 mgd of meat-packing waste water. The oxygen demand of sulfides in the anaerobic lagoon effluent required special consideration in the application of extended aeration to the meat-packing wastes. Although nitrification was not required for the Monfort facility, nitrification could be achieved in the anaerobic effluent by the addition of alkalinity, deepening of the aeration basins, and the installation of either static tube aerators or a diffused aeration system. The extended aeration facility at Monfort achieved an average BOD removal of 98.2%. Odors arising from the anaerobic lagoon were attributed to high sulfate concentrations in the area's water supply. During February 1975, BOD in effluent from the final polishing pond averaged 21 mg/liter; suspended solids in the final pond averaged 30 mg/liter. The polishing pond served as a buffer against occasional upsets in the extended aeration system. (See also W78-04417) (Snyder-FIRL)
W78-04421

A PROGRESS REPORT ON A SYSTEMS APPROACH TO EFFLUENT ABATEMENT IN HAWAII,
Hilo Coast Processing Co., Pepeekeo, HI.
R. T. Webb.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 151-179, 15 fig, 10 tab. Report EPA-600/2-76-224.

Descriptors: *Sugarcane, *Food processing, *Treatment facilities, *Suspended solids, *Harvesting, Hawaii, Pollutant identification, Analytical techniques, Effluents, Pollution abatement, Industrial wastes, Waste water treatment.

The degree of soil pick-up during sugar cane harvesting has been measured by analyses of ashed cores of harvested material. A new cane materials handling (CMH) method averaged 4% ash weekly, a level that was considered to be economically treatable by planned waste water treatment facilities. A pivoted, extendable box was added to infield transporters to allow direct roadside loading of the cane into trucks. Improvements in the raw material quality to minimize waste water treatment requirements at the plant have also allowed modifications in harvesting machines. Removal of soil from the cane by air blasting reduced the quantity of suspended solids in the wash water. The soil reduction efficiency of the new CMH system was reduced by rainfall. The cost of hauling excess material eliminated by CMH approached $1 million, aside from the costs of waste water treatment. The CMH system reduced the quantity of dry solids requiring waste water treatment from 1400 tons/day to 350 tons/day. Preliminary cost estimates have indicated that treatment facilities required by traditional harvesting methods are economically feasible if the 4% ash entrainment standard is met. (See also W78-04417) (Snyder-FIRL)
W78-04422

A FRUIT PROCESSOR'S WASTE TREATMENT EFFLUENT VARIABILITY AND PLANNING FOR ATTAINMENT OF 1983 EFFLUENT GUIDELINES.
Bovay Engineers, Inc., Spokane, WA.
L. A. Esvelt.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 204-222, 4 fig, 7 tab, 6 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Pome fruits, *Peaches, *Activated sludge, *Aerated lagoons, Biological treatment, Treatment facilities, Apples, Biochemical oxygen demand, Industrial wastes, Waste water treatment, Waste water disposal.

The Snokist Growers fruit cannery in Yakima, Washington, constructed a 6,000,000-gal, aerated lagoon system during 1967 for the treatment of cannery wastes. The system was upgraded in 1968 for the mixed activated sludge process with provisions for limited sludge reaeration. The aeration basin was coupled with a 90-ft diam secondary clarifier. A 1,500,000-gal aerated lagoon was used for activated sludge reaeration. Research indicated that biological treatment was feasible for the fruit processing wastes. The system, operated with nutrient addition, removed over 99% of the BOD. The amendments to the Federal Water Pollution Control Act passed in 1972 required industries to use Best Practicable Treatment for waste waters by 1977 and Best Available Treatment by 1983. Snokist Growers' treatment system was presented as an example when guidelines were being developed for peach, pear, and apple processing industries. Improvements being evaluated for compliance with 1983 standards include the use of waste activated sludge as a cattle feed supplement and the potential for waste water reuse in plant operations. (See also W78-04417) (Snyder-FIRL)
W78-04423

MEATPACKING WASTEWATER TREATMENT BY SPRAY RUNOFF IRRIGATION,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Corvallis Field Station.
J. L. Witherow, M. L. Rowe, and J. L. Kingery.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 256-287, 3 fig, 5 tab, 5 ref, append. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Overland flow, *Irrigation systems, *Treatment facilities, *Pilot plants, Phosphorus, Nitrogen, Suspended solids, Organic wastes, Industrial wastes, Waste water treatment, Waste water disposal.

A pilot-scale spray irrigation system was operated at the W. E. Reeves Packinghouse in Ada, Oklahoma, to evaluate the system for treating meat-packing waste water. A goal of 80% removal of both total nitrogen and phosphorus was set and the economic feasibility of the system was examined. The pilot plant included three 1.0-acre irrigation plots. The pilot studies indicated that treatment by screening, spray irrigation and disinfection could produce an effluent which would meet 1977 national discharge limitations. The spray irrigation system removed over 90% of the total nitrogen and 60-90% of the total applied phosphorus. Hydraulic and organic loadings affected removals slightly. Rainfall increased the waste load discharge, indicating the need for control of volume or suspended solids during intense rainfall to meet 1983 treatment standards. Annual capital and operating costs for the pilot system were $0.25/1000 gal. (See also W78-04417) (Snyder-FIRL)
W78-04424

WASTEWATER MANAGEMENT AT HICKMOTT FOODS, INC.,
California Univ., Davis.
G. Ichobanoglous, B. Ostertag, and E. Fernbach.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 288-322, 6 fig, 14 tab, 3 ref. Report EPA-600/2-76-224.

Descriptors: *Canneries, *Tomatoes, *Food processing industry, *Biological treatment, *Activated sludge, Asparagus, Sweet potatoes, Industrial wastes, Waste water disposal, Waste water disposal, Waste water treatment.

Hickmott Foods, Inc., a small independent cannery in Antichoch, California, processes approximately 1,050 tons of raw tomatoes daily. The tomato canning operation generates approximately 880 tons of finished product and 170 tons of wastes daily, with approximately 11 tons of raw product lost to the waste water stream. A waste water control scheme was instituted in 1971 by Hickmott Foods in response to local regulations which required the plant to remove 94% of the BOD and 91% of the suspended solids in the waste water prior to discharge. Various process modifications have significantly reduced the strength and volume of waste water from the canning process. The raw tomato content in the waste water was reduced by the incorporation of dry peeling and various floor waste management practices. The treatment system at Hickmott utilizes raw solids separation, neutralization, nutrient addition, activated sludge process, sedimentation, activated sludge, solids thickening, and cooling water treatment. Sludge from the treatment operation is disposed by land application or used as a cattle feed supplement. The $885,000 treatment facility was operated during the 1974 season at a cost of $4.28/ton of raw tomatoes. (See also W78-04417) (Schulz-FIRL)
W78-04425

PILOT-SCALE TREATMENT OF BRINED CHERRY WASTEWATERS,
Environmental Associates Inc. Corvallis, OR.
A. F. Mauldin, B. W. Hemphill, M. R. Soderquist, D. W. Taylor, and E. Gerding.
In: Proceedings of the Sixth National Symposium on Food Processing Waste, April 9-11, 1975. 1976, p 323-342, 8 fig, 2 tab, 5 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Stone fruits, *Aeration, *Aerated lagoons, *Treatment facilities, Biological treatment, Pilot plants, Biochemical oxygen demand, Industrial wastes, Sewerage, Waste water treatment.

Treatibility of brined cherry waste water by aerobic biological processes was investigated in a bench-scale study at Aqua Tech Laboratories, Incorporated, in Portland, Oregon. Three 4-liter units were charged with diluted spent cherry brine, seeded with raw sewage, and aerated. The conversion of free and combined sulfur dioxide to sulfate was essentially complete after 5 days of aeration. A 7000-gal pilot plant at the Dalles Cherry Growers, Incorporated, the Dalles, Oregon, was operated as an aerated lagoon for 4 mos, then for 3 wks in an extended aeration mode with complete sludge recycling. The waste water from brined cherry pitting was amenable to aerobic biological treatment. The effluent contained virtually no sulfur dioxide, and had a pH near 7.0 without chemical treatment. The most important problem was in maintaining good sludge settling characteristics. The optimum retention time in aerated lagoons was about 10 days. When a spill increased the influent BOD to the aerated lagoon by approximately 1.5 times, the sludge volume index increased from 270 to over 600. Hydraulic and chlorite shock loadings did not cause upsets in the treatment process. (See also W78-04417) (Snyder-FIRL)
W78-04426

CHARACTERIZATION AND POTENTIAL METHODS FOR REDUCING WASTEWATER FROM IN-PLANT HOG SLAUGHTERING OPERATIONS,
Mayer (Oscar) and Co., Madison, WI.
D. O. Dencker, D. L. Grothman, P. M. Berthouex, L. J. P. Scully, and J. E. Kerrigan.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 343-367, 3 fig, 4 tab, 4 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Hogs, *Pollutant identification, *Water conservation, *Water consumption, Water reuse, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Organic wastes, Cattle, Industrial wastes, Waste water treatment.

The quantitative and qualitative characteristics of hog slaughtering wastes were examined at three slaughterhouses operated by Oscar Mayer of Madison, Wisconsin. The plants slaughtered 750-1,000 hogs per hour and also had meat processing facilities. Samples collected at 14 stations throughout the hog slaughtering process were analyzed for total solids, total volatile solids, suspended solids, suspended volatile solids, total Kjeldahl nitrogen, total organic carbon, BOD, and COD. Important pollutant sources were identified in a study which examined the potential for overall reductions in waste loads from various processing stages. Various process modifications were recommended to reduce waste loads. Redesign of the blood receiver to accomodate periodic surges was suggested. The use of recycled water instead of potable water was considered feasible for dehairing operations. A vacuum cleaner was recommended for separating dilute waste water from floor scraps and bone dust. Additional modifications in equipment design to reduce waste loads were also discussed. (See also W78-04417) (Snyder-FIRL)
W78-04427

EGG PROCESSING WASTE RECOVERY,
British Columbia Univ., Vancouver. Dept. of Agricultural Engineering.
N. R. Bulley.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 368-379, 2 fig, 4 tab, 3 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Coagulation, *Organic wastes, *Electrochemistry, *Drying, Organic matter, Biochemical oxygen demand, Solid wastes, Byproducts, Industrial wastes, Waste water(Pollution), Waste water treatment.

Preliminary studies on the treatment of egg processing wastes indicated that the egg albumen and yolk in the waste water could be removed by chemical precipitation, to allow recovery of a portion of this high protein waste. Studies were conducted to investigate the feasibility of pretreating processing waste water for the removal of egg solids. The potential of drying the egg shells, with their associated albumen, was examined with respect to the production of a saleable product as a feed additive for poultry. Experiments with chemical coagulation indicated that the addition of 200 ppm alum at pH 5.1 could remove at least 50% of the egg solids. Electrocoagulation was examined in light of the colloidal nature of the egg processing wastes. The effects of time, temperature, electrode surface area, electrode separation, pH, and waste concentration on floc formation and settling were investigated with a laboratory-scale electrocoagulation system. The system removed 60-70% of the effluent solids within 15 min. Favorable results in studies on forced-air drying of egg shells indicated that the process deserves further attention by egg processors. (See also W78-04417) (Schulz-FIRL)
W78-04428

ROTATING BIOLOGICAL SURFACE TREATMENT OF VEGETABLE CANNING PROCESS WASTEWATER,
Rieke, Carroll, Muller Associates, Inc., Hopkins, MN.
R. F. Roskopf, F. D. Osborn, D. A. Watson, and G. E. Flann.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 380-406, 13 fig, 1 tab. Report EPA-600/2-76-224.

Descriptors: *Canneries, *Vegetable crops, *Biological treatment, *Treatment facilities, *Food processing industry, Surfaces, Dissolved oxygen, Biochemical oxygen demand, Industrial wastes, Waste water treatment, Waste water(Pollution).

A pilot study was conducted at the Owatonna Canning Company in Owatonna, Minnesota, to evaluate the rotating biological surface (RBS) process for the treatment of vegetable canning wastewater. The facility cans asparagus, peas, beans, corn, pumpkin, and beef stew. Three RBS pilot plants, each using a semicylindrical tank 4.23 ft long and 4.0 ft in diameter as a flow-through chamber, were operated. They were designated as polyplant-1, polyplant-2, and lagplant. The polyplants treated screened waste water. The lagplant treated effluent from an anerobic lagoon, the first stage of the plant's waste water treatment system. Biological growth on the first stage of the plant's waste water treatment system. Biological growth on the RBS units became darker and more fibrous as its thickness increased. Dissolved oxygen (DO) levels from the polyplants ranged from 0.5-7 mg/liter higher than the influent levels; a decrease in flow rates increased the difference in DO levels. BOD in influent to the polyplants ranged 240-1800 mg/liter; effluent BOD ranged 6-1385 mg/liter. Most of the Kjeldahl nitrogen removed by the RBS units was associated with settleable solids. DO levels in the lagplant effluent were 3-7 mg/liter higher than influent levels. The lagplant removed a smaller percentage of suspended solids than did the polyplants, possible because the lagplant influent contained lower concentrations of suspended solids. (See also W78-04417) (Snyder-FIRL)
W78-04429

A PRELIMINARY REPORT ON STUDIES TO DEVELOP ALTERNATIVE METHODS OF REMOVING POLLUTANTS FROM TUNA (ALBACORE) PROCESS WASTEWATERS,
National Marine Fisheries Service, WA. Pacific Utilization Research Center.
H. J. Barnett, and R. W. Nelson.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 407-417, 4 fig, 2 tab, 9 ref. Report EPA-600/2-76-224.

Descriptors: *Fish handling facilities, *Canneries, *Marine fish, *Flotation, *Treatment facilities, Food processing industry, Screens, Centrifugation, Coagulation, Pilot plants, Aeration, Industrial wastes, Waste water treatment.

Pilot studies at a seafood cannery evaluated a modified air flotation system for treating tuna processing waste water. The relatively inexpensive, modified air flotation-double screening technique used an 18 inches Bauer Hydrasieve tangential screen and a Sweco 12' centrifugal waste water concentrator. Without coagulant addition, suspended solids reductions were not significantly improved by the addition of dispersed air flotation after double screening. Coagulant concentrations of 20 ppm alum and 150 ppm lime produced the best results with double screening and dispersed air flotation. The aeration produced by centrifugal screening and dispersed air addition further facilitated the formation of the sludge blanked in the flotation cell. (See also W78-04417) (Snyder-FIRL)
W78-04430

EFFLUENT VARIABILITY IN THE MEAT-PACKING AND POULTRY PROCESSING INDUSTRIES,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Corvallis Field Station.
J. F. Scaief.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 418-456, 16 fig, 11 tab, 4 ref, 1 append. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Poultry, *Biochemical oxygen demand, *Suspended solids, *Standards, Regulation, Effluents, Biological treatment, Treatment facilities, Organic wastes, Activated sludge, Aerated lagoons, Industrial wastes, Waste water treatment.

The efficiencies of various combinations of in-plant controls and waste water treatment processes were evaluated at six meat processing plants and four poultry processing plants. Water consumption at the meat processing plants ranged 525-1,870 gal/1,000 lbs. Waste water at the poultry processing plants was generated at a rate of 24.7-26.0 liters/bird. Reductions in water consumption reduced waste water treatment requirements. The meat packing plants achieved 1977 standards for BOD in effluents. A duck processing plant achieved 1983 standards for BOD and suspended solids. For both types of plants, abnormal weather conditions produced high pollutant loads in the effluent. Poultry processing plants having aerated lagoon or activated sludge systems were more capable of meeting effluent standards than plants using other types of waste water treatment. A plant which exceeded daily effluent standards was also likely to exceed weekly and monthly limitations. This suggested that daily BOD discharges had to be below the 30-day average for compliance with monthly BOD limitations. (See also W78-04417) (Snyder-FIRL)
W78-04431

INDUSTRIAL WASTEWATER RECLAMATION WITH A 400,000-GALLON-PER-DAY VERTICAL TUBE EVAPORATOR,
General Tire and Rubber Co., Akron, OH.
W. C. Lang, J. H. Crozier, F. P. Drace, and K. H. Pearson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 361, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-260, October 1976. 98 p, 15 fig, 16 tab, 5 ref, append.

Descriptors: *Industrial wastes, *Synthetic rubber, *Evaporators, *Reclaimed water, *Treatment facilities, Reclamation, Evaporation, Impaired water quality, Corrosion, Fouling, Waste water(Pollution), Waste water treatment, Waste water disposal.

The General Tire and Rubber Company's synthetic rubber plant at Odessa, Texas, has a nominal rated capacity of 40,000 tons per year of butadiene-styrene type synthetic rubber (GRS). Waste water flow rates at the plant are as high as 750,000 gpd. A 14-effect vertical tube evaporator was built for recovering water from a waste water stream containing 3500 ppm dissolved solids, mostly chlorides and sulfates, and organics in excess of 100 ppm. Water having almost no organics and a very low dissolved solids level was recovered for use in the manufacturing process. An attempt was made to determine the ratio of the quantities of recovered water to waste water, the amount of reclaimed water per unit of thermal energy applied, and the plant performance at various feed rates. Corrosion resistance, the rate of scaling or fouling on the heat exchange surfaces, and utility requirements were also examined. Engineering data to improve the design of future plants, concentrations of organics and dissolved solids in waste water and reclaimed water, and costs for water reclamation were presented. Over short periods, performance exceeded design expectations. Corrosion of the heat exchange surfaces which made continuous operation for long periods impossible was attributed to the presence of 2-5 ppm of sulfides in the feed water. Retubing the copper alloy unit with titanium eliminated corrosion, but not fouling. Pretreating the waste water did not reduce fouling. Direct operating costs ranged $0.80-8.44/1,000 gal of recovered water. (Snyder-FIRL)
W78-04432

EFFECTIVENESS OF SURFACE MINE SEDIMENTATION PONDS,
Hittman Associates, Inc., Columbia, MD.
D. V. Kathuria, M. A. Nawrocki, and B. C. Becker.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 917, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-117, August 1976. 100 p, 34 fig, 7 tab, 9 ref, 3 append.

Descriptors: *Coal mine wastes, *Settling basins, *Suspended solids, *Surface runoff, *Rainfall, Efficiencies, Treatment facilities, Sediment control, Sediments, Kentucky, West Virginia, Pennsylvania, Industrial wastes, Waste water treatment.

Nine sedimentation ponds at surface coal mining operations in Pennsylvania, West Virginia, and Kentucky were evaluated for reducing suspended solids in storm runoff. The ponds included: a 34.5 m by 16.2 m primary pond and 30.5 m by 16.5 m secondary pond; a 13.1 m-diam secondary pond, combined with a somewhat larger primary pond; two primary impoundments, combined with a secondary impoundment 200 m downstream; an impoundment averaging under 0.7 m deep near the riser pipe; a pond of approximately 200 ft by 60 ft; three ponds created by 6.1 m-high embankments; and a 125 ft by 35 ft pond. The ponds were sampled during baseline and rainfall events. Theoretical and actual suspended solids removal efficiencies were compared. Major problems resulted from poor construction and inadequate maintenance. Suspended solid removal efficiencies were generally much lower during a storm. Theoretical predictions of efficiency were essentially correct under baseline condtions. Generally, theoretical removal efficiencies were much higher than actual efficiencies during rainfall. (Snyder-FIRL)
W78-04433

OZONE OXIDATION OF METAL PLATING CYANIDE WASTEWATER,
CPAC Inc., Leicester, NY.
D. A. Johnston.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 003, Price codes: A05 in paper copy, A01 in microfiche. Final Report AFCEC-TR-76-13, September, 1976. 72 p, 21 fig, 7 tab, 10 ref, append.

Descriptors: *Cyanide wastewater, *Oxidation, *Ozone, *Metals, *Nitrogen compounds, *Treatment facilities, Iron compounds, Nickel, Cadmium, Maintenance, Industrial wastes, Water pollution sources, Waste water(Pollution), Waste water treatment.

Electroplating associated with maintenance of aircraft engines produces cyanide-bearing waste water. A process developed by the Houston Research Corporation uses ozone to oxidize the cyanides. A plant was designed and installed at Tinker Air Force Base in Oklahoma for treating 3000 gal/mo of nickel strip waste at total cyanide concentrations as high as 50,000 mg/liter. Ozone was very effective and economically competitive for destroying simple cyanides and most metal complexes. Destruction of the iron complex was very difficult to achieve, even under ultraviolet light and at 150 F. A plant using this treatment process can be automated and can perform continuously for several weeks. Levels of cyanide, nickel, and cadmium in effluent from the treatment process are reportedly below detection limits. (Snyder-FIRL)
W78-04435

TREATMENT OF ELECTROPLATING WASTES BY REVERSE OSMOSIS,
American Electroplaters' Society, East Orange, NJ.
R. G. Donnelly, R. L. Goldsmith, K. J. McNulty, D. C. Grant, and M. Tan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 393, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-261, September 1976. 95 p, 50 fig, 16 tab, 11 ref.

Descriptors: *Electroplating wastes, *Chemical wastes, *Reverse osmosis, *Semipermeable membranes, *Industrial water, *Polymers, Nickel, Copper compounds, Zinc, Chlorides, Feasibility, Impaired water quality, Industrial wastes, Waste water treatment.

Wastes from nine different electroplating systems were treated with reverse osmosis (RO) in pilot studies conducted to provide data for estimating the feasibility of RO for a specific plating waste. The plating wastes were obtained from Whyco Chromium Company, Honeywell, Hempden Colors and Chemicals, General Electric, and American Electroplating Company. Technical feasibility was demonstrated for Wattstype nickel, nickel sulfamate, copper pyrophosphate, nickel fluroborate, zinc chloride, copper cyanide, zinc cyanide, and cadmium cyanide systems. Cellulose acetate membranes were recommended for waste water having a pH of 2.5-2.0; polyamide membranes were suggested for a pH range of 4-16. The data indicated that the extent to which RO would concentrate recycled plating chemicals in commercial-scale installations was dependent on the particular situation. The effect of buildup of impurities in closed-loop operation also differed for each bath. The selective removal of certain components in plating baths by RO systems led to the need for chemical addition prior to reuse. (Snyder-FIRL)
W78-04437

BIOLOGICAL TREATMENT OF CONCENTRATED SUGAR BEET WASTES,
Beet Sugar Development Foundation, Fort Collins, CO.
J. H. Fischer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 123, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-660/2-74-028, June 1974. 100 p, 13 fig, 11 tab, 38 ref, 3 append.

Descriptors: *Food processing industry, *Sugar beets, *Water reuse, *Pollutant identification, *Treatment facilities, Reclaimed water, Neutralization, Screens, Industrial wastes, Waste water disposal, Waste water treatment.

A study was undertaken to develop a closed-loop waste water treatment system for flume water used for conveying and washing in a sugar beet factory operated by the Great Western Sugar Co. at Longmont, Colorado. The factory processed an average of 3,307 tons of beets daily. Recirculation of flume waters was shown to be possible. An estimated 30-50 tons of wet material was removed daily by screening; lime was added continuously prior to sedimentation. Primary settling was accomplished with two ponds used alternately. The effluent was further treated by secondary settling before being returned to the conveying and washing operations. An anerobic pond, designed to degrade the remaining solids in 100 gpm of surplus water, effectively treated the total flume water after each operating cycle. Floating surface aerators were used to reduce odors during final polishing. Biological and nutritional data were collected. Although the treated product water also met discharge standards, it was reused in the system. (Snyder-FIRL)
W78-04438

WASTE TREATMENT AND DISPOSAL METHODS FOR THE PHARMACEUTICAL INDUSTRY,
National Field Investigations Center-Denver, CO.
E. J. Struzeski, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 582, Price codes: A13 in paper copy, A01 in microfiche. Report EPA/330/1-75-001, March 1975. 282 p, 5 fig, 58 tab, 120 ref, append.

Descriptors: *Chemical wastes, *Activated sludge, *Trickling filters, *Treatment facilities, *Biochemical oxygen demand, Chemical oxygen demand, Biological treatment, Industrial wastes, Pollution abatement, Waste water treatment, Waste water disposal.

A survey of 39 pharmaceutical plants and a literature review were conducted to provide data which was used to establish effluent limitations. Five categories of pharmaceutical plants were studied, including those using fermentation, organic synthesis, or combinations of the two; those producing vaccines and antitoxins; and those producing the final form of pharmaceutical preparations. The study of fermentation included fermentation media, vitamin manufacture, citric acid manufacture, antibiotics manufacture, and enzymes production. The study of organic synthesis encompassed vitamin maufacture, a synthetic antibiotic sulfa drugs, steroids, and prostaglandins. Wastes from synthesized chemical production were strong, variable, difficult to treat, and often toxic to biological treatment systems. Important parameters in pharmaceutical wastes included short and long-term BOD, COD, total organic carbon (TOC), solids, pH, trace metals an other ions, unoxidized nitrogen, phosphorus, color, odor, temperature, and toxicity. Waste treatment and disposal methods included activated sludge, trickling filtration, anaerobic filters, spray irrigation, oxidation ponds, sludge stabilization, and deep well injection. The more sophisticated treatment facilities generally used multi-stage activated sludge or trickling filtration processes. (Snyder-FIRL)
W78-04440

TREATING METAL FINISHING WASTES, PART 2,
New Jersey Inst. of Tech., Newark.
P. N. Cheremisinoff, A. J. Perna, and J. Ciancia.
Industrial Wastes, Vol. 23, No. 1, p 32-34, January/February, 1976.

Descriptors: *Metals, *Evaporation, *Electrolysis, *Ozone, *Industrial wastes, Sludge treatment, Water reuse, Oxidation, Reverse osmosis, Costs, Chemical wastes, Waste water treatment, Waste treatment.

The treatment of wastes from the metal finishing industry was explored. Chromium, cyanide and other rinse waters have been treated by single and multiple stage evaporation. This process is economical only for concentrated rinses and requires segregation of wastes by compatible types, the use of various means for excluding or removing impurities, and careful rinsing and water use by the metal finisher. Chemical dragout is concentrated in the rinse water to process bath strength and returned to the process tanks. Evaporated water is returned to the rinsing system. An integrated system segregates and treats rinse water waste at the source by simultaneous removal and treatment of the liquid film of processing solution adhering to the part removed from the metal finishing bath. A chemical wash tank is substituted for the first rinse tank following the metal finishing operation. Electrolytic decomposition of cyanide in an alkaline solution, of less toxic cyanide complexes such as ferro and ferricyanide has been used to dispose of cyanide-bearing waste waters. Ozone has been found suitable for cyanide oxidation, with the final reaction yielding mostly cyanate. Permanganate treatment of cyanide and hydrogen peroxide destruction of cyanide are other treatment methods. Electrodialysis and reverse osmosis as well as the biological degradation of cyanide have also been investigated. Sludge treatment can eliminate potential ground and surface water contamination by toxic metals; and recovery of valuable metals from sludge can offset costs. (Collins-FIRL)
W78-04442

DEVELOPING A METHODOLOGY FOR DESIGN OF EQUALIZATION BASINS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
E. A. R. Ouano.
Water and Sewage Works, Vol 124, No 11, p 48-52, November, 1977. 7 fig, 1 tab, 8 ref.

Descriptors: Analytical techniques, *Treatment facilities, *Methodology, *Design criteria, *Basins, Design, Mathematical studies, Resistance, Fluctuations, Variability, Water quality, Waste water(Pollution), Waste water treatment, *Equalization basins, Sewage lagoons.

Rational design criteria and methods are needed for equalization basins. Equalization basin design criteria are dependent on the tolerance to shock loads of the waste water treatment process used after equalization, the fluctuations of waste water quality and quantity, and the mixing pattern in the equalization basin. A three-dimensional diffusion equation is given for a shallow, rectangular equalization tank. Plug flow conditions should be avoided in equalization basins, because no equalization takes place under these conditions. A mass balance relationship is used to establish the governing equation for a completely mixed system. The equalization basin should be large enough for the maximum required volume, plus a safety factor. For flow patterns between completely mixed and plug flow, a dispersion number over 0.2 is a good compromise between maximizing mixing and preventing short-circuiting. An equalization basin's design efficiency also depends on the biochemical or chemical reactions occurring in the basin. These reactions, the tolerance to shock loads, the waste water fluctuations, and the mixing pattern can be easily incorporated into equalization basin design with a computer program for complete mixing. A tracer study on a model equalization basin could be used to estimate the correction for non-ideal flow. (Snyder-FIRL)
W78-04469

TANNERY POLLUTION UP-DATE,
T. Thorstensen.
The Leather Manufacturer, Vol 94, No 12, p 28-30, December, 1977. 4 fig.

Descriptors: *Tannery wastes, *Industrial wastes, *Suspended solids, *Chromium, *Sulfides, Hydrogen ion concentration, Oil wastes, Waste water treatment.

Recent advances in the field of tannery pollution control are presented. Differentiation is made between direct and indirect dischargers of pollutants. Waste water parameters of significance to a tannery include: flow, suspended solids, BOD, sulfides, chromium, oil and grease, and pH. One of the more significant advances in BOD reduction has been the development of the TNO unhairing process, which involves soaking the hides in calcium chloride before unhairing with caustic soda and sodium sulfide. Lime is not required and water consumption is kept to a minimum. Acidification of the TNO unhairing waste water causes the protein materials to coagulate, thereby clarifying the waste water to remove 95% of the suspended solids and 80% of the BOD. Recycling, chemical oxidation, and acidification are currently used to remove sulfides from tannery wastes. (Baker-FIRL)
W78-04470

MECHANICAL DEWATERING ALTERNATIVES FOR WASTE ACTIVATED SLUDGE--A PILOT STUDY,
National Council for Air and Stream Improvement, Kalamazoo, MI.
R. A. Miner, D. W. Marshall, and I. Gellman.
TAPPI, Vol 60, No 12, p 102-105, December, 1977. 2 tab, 4 ref.

Descriptors: *Dewatering, *Sludge treatment, *Filters, *Pulp wastes, *Pulp and paper industry, Industrial wastes, Filtration, Separation techniques, Equipment, waste water treatment.

A pilot study was conducted to evaluate biological sludge thickening and dewatering alternatives for the pulp and paper industry. Pressure filtration, precoat vacuum filtration, centrifugation, and ultrafiltration were tested with waste activated sludge resulting from waste water treatment at an integrated bleached kraft-fine paper mill. Three levels of dewatering efficiency based on cake consistency were observed. Pressure filtration and precoat vacuum filtration generated the driest cakes; filter belt pressing yielded intermediate cake consistencies; and gravity filtration, centrifugation, and ultrafiltration resulted in relatively low cake consistencies. Changes in the feed sludge consistency, the amount of sludge conditioning, and the sludge's specific resistance to filtration had a large effect on the quality of final product. The type and amount of sludge conditioning required varied with the dewatering technique employed, the desired level of performance, and the consistency and nature of the sludge. (Baker-FIRL)
W78-04471

STUDIES ON THE TREATMENT OF PULP WASTE WATERS BY REVERSE OSMOSIS AND OTHER TECHNIQUES (GYAKUHINTO HO NADO NI YORU PARUPU HAISUI SHORI GIJUTSU NI KANSURU KENKYU),
Agency for Industrial Science and Technology, Tokyo (Japan). National Chemical Lab. for Industry.
J. Kato, H. Masuda, T. Nakane, C. Kamizawa, and M. Matsuda.
Tsusansho Kogyogijutsuin Sangyo Kogai Kenkyu Choseikyoku 51 Nendo Kogaitokubetsu Kenkyu Hokoku, (Report of 1976 Pollution Special Res. by Industrial Pollution Res. Coordinative Bureau), p 441-446, July, 1977. 3 fig, 2 tab, 16 ref.

Descriptors: *Pulp and paper industry, *Reverse osmosis, *Membranes, *Pulp wastes, *Industrial wastes, Waste water treatment, Separation techniques, Lignins, Water treatment.

Reverse osmosis was evaluated for the treatment of waste water from the electroplating and pulp and paper industries. The recovery of solutes such as carboxylic acid, amino acid, surfactants, and heavy metals from pulp and plating rinse waste waters was investigated using cellulose acetate membranes. Treatment of pulp waste water yielded organic and inorganic solids concentrations of 5% by wt. Reusable water was also obtained. Continuous testing revealed that cellulose acetate membranes lasted at least three months in the treatment of chromic plating rinsing waters. A cartridge module designed for easy membrane replacement was developed to treat both the pulping waste and the plating rinse. Solvent extraction techniques for recovery of hemicelluloses, lignosulfonates, and saccharides from spent pulping liquors were devised. After modification with demetoxylation, the lignosulfonates were used as coagulants to improve sludge dewatering. A synthetic inorganic adsorbent was developed to remove 98% of the color, 90% of the lignin and 83% of the COD from kraft pulp bleaching liquor. (Lisk-FIRL)
W78-04472

REMOVAL OF ZN OR CD AND CYANIDE FROM CYANIDE ELECTROPLATING WASTES,
Energy Research and Development Administration, Washington, DC.
F. L. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 as PAT-APPL-556 353, Price codes: A02 in paper copy, A01 in microfiche. Patent Application, Serial Number 556 353, March 7, 1975. 8 p, 1 fig, 3 tab.

Descriptors: *Cyanide, *Chemical wastes, *Solvent extractions, *Zinc, *Cadmium, *Nitrogen compounds, Liquid wastes, Aqueous solutions, Patents, Ammonium compounds, Organic compounds, Industrial wastes, Effluents, Waste water treatment.

A method of liquid-liquid solvent extraction was patented for recovering Zn or Cd and cyanide from electroplating waste water. The process can be used to treat aqueous effluents such as spent electroplating solutions or rinse waters. The method efficiently strips Zn or Cd from stable quaternary amide and cyanide complexes. A solution of an alkali metal hydroxide is used to quantitatively strip the metal and cyanide content from a saturated extract of the quaternary ammonium complex and to regenerate a quaternary ammonium hydroxide salt which can then be used in subsequent extractions. Zinc is very efficiently extracted over a wide range of sodium hydroxide concentrations. Zinc-cyanide feed solutions containing 50 ppm cyanide can be extracted to produce an aqueous raffinate containing less than 2 ppm cyanide. (Snyder-FIRL)
W78-04473

EFFECT OF GREASE ON WASTEWATER TREATMENT UNIT PROCESSES,
Missouri Univ., Columbia. Dept. of Civil Engineering.
S. K. Banerji.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 049, Price codes: A02 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, January 1978. 15 p, 4 fig, 4 tab, 14 ref. OWRT A-100-MO(1). 14-34-0001-7054.

Descriptors: *Grease, *Oil, *Waste water treatment, *Settling basins, *Sludge thickening, Missouri, Treatment facilities, *Sewage treatment, *Flocculation(Settling).

The objective was to determine the levels of grease and oil in raw sewage that affect the settling characteristics of suspended solids in raw sewage and sludge thickening. Raw sewage from City of Columbia, Mo., Trickling Filter plant was used to determine settling behavior of suspended solids in raw sewage in presence of various levels of grease and oils. The settling tests were performed in 7 1/2 inch diameter and about 3' long plexiglas columns. The procedure used to determine the settleability of these flocculant suspensions was to measure the suspended solids concentration at various depth at different times after the quiescent settling was started. Sludge for the thickening experiment was obtained from City of Columbia, Mo., Activated Sludge Plant. The activated sludge was allowed to settle in a 4 inch diameter settling column. The zone settling velocity of the sludge-water interface was determined in presence of varying concentration of grease and oil. For settling tests at elevated grease levels, additional grease in the form of 1:1 mixture of cooking corn oil and commercial motor oil was added to the sludge and sewage under test. The conclusions are: (1) Levels of grease higher than about 50 mg/l may interfere with flocculant settling of raw sewage solids and reduce the efficiency of primary clarification. However, at levels of grease higher than 120 mg/l the solids removal efficiency is restored and these high grease levels do not interfere with raw sewage particle flocculant settling. (2) Presence of high levels of grease (> 100 mg/l) actually promotes activated sludge thickening. However at these high levels of grease the sludge bulks initially and clarification is poor. The presence of grease up to 100 mg/l does not appear to have any negative effects on clarification behavior of sludge.
W78-04492

ACCUMULATION OF SLIME IN DRAINAGE PIPES AND THEIR EFFECT ON FLOW RESISTANCE,
Clay Pipe Development Association Ltd., London (England).
For primary bibliographic entry see Field 8B.
W78-04506

THE SIGNIFICANCE OF STORMWATER RUNOFF IN AN URBANIZING WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 5B.
W78-04512

STORM SEWAGE OVERFLOWS,
Liverpool City Council (England). Dept. of the City Engineer.
For primary bibliographic entry see Field 8C.
W78-04550

WORKING PARTY ON THE HYDRAULIC DESIGN OF STORM SEWERS.
For primary bibliographic entry see Field 8B.
W78-04551

BEST MANAGEMENT PRACTICE FOR URBAN STORM AND COMBINED SEWER POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W78-04552

HIGH WATER DISCHARGING OR RAIN BASINS (HOCHWASSERENTLASTUNGEN ODOR REGENBECKEN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
W. Munz.
Gas-Wasser-Abwasser, Vol. 57, No. 12, p 861-868, 1977. 5 fig, 2 tab, 8 ref.

Descriptors: *Storage capacity, *Overflow, *Runoff, *Waste water treatment, *Storage tanks, Storm water, Storm runoff, Flood flow, Waste water disposal, Treatment facilities, Switzerland.

Criteria used in Switzerland for the selection of storm water storage tanks and combined sewer overflow facilities are discussed. Although the installation of stand-by storage tanks is not required for facilities whose capacities are only exceeded during intense storms, stand-by storage facilities are recommended for reducing the load on the treatment plant during wet weather. The effects of the volume of storm water storage tanks and the maximum flow rate towards the treatment plant are evaluated with respect to the magnitude of the combined sewer overflow. Several storm water and treatment configurations currently in use in Swizterland are reviewed. A formula which considers the degree of protection required for receiving waters is presented for the selection of design capacities and storage volumes for storm water treatment facilities. (Lisk-FIRL)
W78-04553

EVALUATION OF STORM WATER ROUTEING MODELS,
MacLaren (James F.) Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5G.
W78-04554

$4.7 BILLION FOR SAO PAULO SEWERS MARKS INVESTMENT SHIFT BY BRAZIL.
For primary bibliographic entry see Field 5G.
W78-04555

FIXED-GRID CHARACTERISTIC FOR PIPELINE TRANSIENTS,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-04559

SEWERAGE IN RURAL AREAS,
G. Bishop, and T. H. Kirby.
Journal of the Institute of Water Pollution Control, Vol. 76, No. 4, p 423-436, 1977. 5 fig, 2 tab, 7 ref.

Descriptors: *Sewerage, *Treatment facilities, *Sewage treatment, *Drainage systems, *Regional development, Rural areas, Sewers, Manholes, Overflow, Waste water treatment, Municipal wastes.

Guidelines for the selection and installation of sewage systems in rural areas are presented. The study emphasizes the need to consider the geographical location and the type of usage a sewage system will encounter. Sewers are usually installed to accomodate both the natural fall of the land and the best route to an outfall or treatment plant. The study suggests that, in rural areas, lines should also be placed beneath the roads whenever possible. Consideration of depth of sewer lines and the number of pumping stations is recommended in flat areas. In order to prevent the growth of bacterial slime in the pipe, it is suggested that pipe size be selected to provide a minimum flow velocity of 0.75 m/sec. Automatic and reliable pumping stations are recommended for fewer repairs and lower maintainence requirements. A submersible pumping plant, where feasible, can be economically attractive. Rising mains with a minimum velocity of 0.75 m/sec are recommended for pumping sewage. Methods to prevent hydrogen sulfide production in rising mains are also discussed. (Lisk-FIRL)
W78-04560

NEW PORTOBELLO OUTFALL, BRIGHTON.
For primary bibliographic entry see Field 5E.
W78-04561

PURIFICATION OF WASTE WATER.
Australian Patent 485,192. Issued August 4, 1977. The Australian Official Journal of Patents, Trademarks, and Designs, Vol. 47, No. 28, p 2569, August, 1977.

Descriptors: *Separation techniques, *Heat treatment, *Patents, Equipment, Flocculation, Immiscibility, Liquid wastes, Waste water treatment, *Gravity separation(Wastes).

A patent has been issued for a separation technique to be used with waste water containing a water-insoluble liquid with a specific gravity lower than water and a water-insoluble liquid with a specific gravity higher than water. The method utilizes a gravity separator with a tilted-plate, laminated assembly. Waste water in the form of a colloid or finely dispensed state is introduced into the separator. Warm water is added to the waste water to provide sufficient heat to compensate for the temperature loss in the waste water while in the separation assembly. Floc precipitation is thereby prevented at least until the waste water leaves the assembly. (Schulz-FIRL)
W78-04562

DEEP SHAFT BIOLOGICAL PURIFICATION OF WASTE WATER--WITH CIRCULATORY DRIVING FORCE GAS TAILORED TO POLLUTION INTENSITY.
Netherlands Patent NL 7705-308. Issued November 16, 1977. Derwent Netherlands Patents Report, Vol. Y, No. 48, p 4, January, 1978.

Descriptors: *Waste water treatment, *Deep wells, *Biochemical oxygen demand, *Oxygenation, *Circulation, *Patents, Equipment, Design data, Municipal wastes, Sewage treatment.

A method of deep shaft waste water treatment using forced air or gas circulation has been patented. The liquid is circulated by air that is driven through a riser passage which is larger in diameter at its lower end than at its upper end. The velocity of the liquid through the upper area of the riser passage should be about 1.2-1.5 m/sec. In the lower section of the downflow passage, oxygen-bearing gas is forced into waste water which moves at about 1.3-2.0 m/sec. The liquid passes through the lower part of the riser passage at a rate of at least 0.6 m/sec. The rage of oxygenation can be adjusted according to the waste strength. The addition of more oxygen to control the BOD in waste water with low pollutant levels is unnecessary because of the greater degree of circulation acheived by the design of the passage cross-sections. (Lisk-FIRL)
W78-04563

SEWAGE WASTE BIOLOGICAL TREATMENT DEVICE--HAS HORIZONTAL ROTOR WITH SPOKED ARMS TO CONTROL DISCHARGE OF SOLID WASTE.
German Patent DS 2500-031. Issued November 17, 1977. Derwent German Patents Abstracts, Vol. Y, No. 47, p 4, January, 1978.

Descriptors: *Waste water treatment, *Patents, *Solid wastes, Bearings, *Design data, Separation techniques, Municipal wastes, Waste water disposal, *Biological treatment, Sewage treatment.

A patent has been issued for a device to control solid waste discharge during biological sewage treatment by composting. Waste material enters the vertical compartment of a compost preparation tank through an inlet at the top. The discharge system, located at the bottom of the composter, contains one or more radial shafts mounted on a pivot. Radial discharge bolts which are located along the length of the shaft's periphery extend into the discharge mechanism. Support struts, which form the sides of the discharge hole, are located between the shafts, with the inner ends secured to the shaft butt. A bearing ring which joins the outer ends of the support struts is attached to a gear rim. A hydraulic drive ratchet, connected to the gear rim, operates the frame. (Lisk-FIRL)
W78-04564

DIFFUSING GAS INTO LIQUIDS, ESPECIALLY AERATING WASTE WATER--WITH SYNERGISTIC REDUCTION IN ENERGY REQUIRED FOR MASS TRANSFER OPERATION.
Belgian Patent BE-854-872. Issued November 21, 1977. Derwent Belgian Patents Abstracts, Vol. Y, No. 47, p 4, January, 1978.

Descriptors: *Aeration, *Mass transfer, *Activated sludge, *Biological treatment, *Patents, Equipment, Design data, Air-water interfaces, Shear drag, Waste water treatment, Municipal wastes.

A waste water aeration system displaying a snyergistic reduction in the quantity of energy required for mass transfer has been patented. The system includes a hollow bell which rotates on a vertical axis at the lower end of a coaxial shaft attached at the apex of the bell. The angle of the bell's apex is at least 130 degrees; the symmetrical base angles are at least 60 degrees. Outlets located around the circumference of the bell's base discharge gas. Waste water is pumped along the gas outlets along the sides, creating a shearing effect through interfacial turbulence between the gas and liquid. This shearing action reduces the contacting resistance of the interfacial films. The process is effective in aeration during biological waste water treatment, especially for the activated sludge process. (Lisk-FIRL)

W78-04565

THE BANGOR PROJECT.
For primary bibliographic entry see Field 5E.
W78-04566

COMPOSTING RAW SLUDGE,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5E.
W78-04567

CENTRIFUGE FOR CONCENTRATING ACTIVATED SLUDGE, (CONCENTRATION CENTRIFUGE DES BOUES ACTIVEES).
La Technique Moderne, Vol. 69, No. 1, p 34, January, 1977. 2 fig.

Descriptors: *Centrifugation, *Activated sludge, *Sludge treatment, *Dewatering, *Separation techniques, Anaerobic digestion, Screens, Equipment, Waste water treatment.

Advantages of centrifugal thickening of activated sludges include no surcharging of primary clarifiers, reduced water recycling between anaerobic digesters and the treatment plant, better gas production during digestion, and lower energy needs. Screening devices in mechanical thickeners have presented problems. The Celleco Microsorter solves these problems by eliminating all solid particulates at the pre-screening stage. The main components of the system are a self-cleaning screen, the Microsorter, and the FESX 412/512 disk separator, which continuously discharges the concentrate through the nozzles. Gravity separation removes the solids from the apparatus after collection. The system can handle 20-30 cu m/hr of a feed solution containing up to 2% dry solids. (Blits-FIRL)
W78-04568

NEW WASTE TREATMENT SYSTEM.
Consulting Engineer, Vol. 49, No. 4, p 122, 124, October, 1977.

Descriptors: Biological treatment, *Treatment facilities, *Solid contact processes, *Trickling filters, Municipal wastes, Filters, Biodegradation, Waste water treatment.

Kramer, Chin and Mayo, Inc. of Seattle, Washington, have designed a $2,220,000 waste water treatment system for the city of Monroe, Washington. The projects objectives were to increase Monroe's sewage disposal capacity and quality while providing for anticipated population increases and annexations. The rotating biological contactor system which was supplied by Atuotrol Corporation of Milwaukee, Wisconsin, provides both primary and secondary treatment. Three fine screens eliminate setteable solids during primary treatment. In the secondary treatment phase, the screened waste water passes to four 11 in-diam biological contactors. Hundreds of polyethylene discs are attached to the steel shaft of each contactor to provide a suitable medium for bacterial growth. The shaft rotates to provide continuous contact between the bacterial growth and the waste water nutrients for conversion of the organic matter into carbon dioxide and water. (Schulz-FIRL)
W78-04569

SLUDGE TOXICITY REDUCED.
Consulting Engineer, Vol. 49, No. 4, p 146, 148, October, 1977.

Descriptors: *Oxidation, *Chemical wastes, *Sewers, *Toxicity, *Sewage treatment, Organic compounds, Incineration, *Sludge treatment, Dewatering, Municipal wastes, Waste water treatment.

Zimpro Inc. of Rothschild, Wisconsin, was contracted by the United States EPA and the City of Louisville, Kentucky, for detoxification of a municipal sewer system which had been accidentally contaminated with hexachlorocyclopentadiene and octachlorocyclopentadiene. Preliminary tests by Zimpro indicated that low-pressure wet-air oxidation was capable of producing a 93% reduction in the chemicals. The oxidized sludge was then dewatered and incinerated in a multiple-hearth furnace. Concentrations of hexachlorobenzene, a more stable toxicant, were also reduced substantially by the Zimpro treatment process. Approximately 6 million gallons of contaminated sludge has already been treated in trial runs with Zimpro equipment at the Morris Forman waste water treatment plant in Louisville. (Schulz-FIRL)
W78-04570

SEWAGE TREATMENT IN THE 1980S,
W. J. Stuart.
Water Services, Vol. 81, No. 978, p 483, 486, August, 1977.

Descriptors: *Aeration, *Construction materials, *Sludge treatment, Equipment, *Sewage treatment, Waste water treatment, Design data, Tertiary treatment, Concrete technology.

The Spiral 'S' aeration system has been developed by the Inka Division of A Johnson Construction Ltd. The system includes a series of internal concentric tanks which are arranged to provide plug flow conditions through the aeration zone. The concentric channels also eliminate problems associated with surface screw and short circuiting of inlet plug flows. Inlet screening, grit removal, aerobic waste sludge treatment, internal settling tanks, and flocculation tanks can be incorporated into the system. The precast concrete tank construction and the process design result in a low overall cost for the system. Spiral 'S' aeration tanks are available in sizes for a population range of 4,000-40,000 and can be arranged in parallel according to desired size and loading capacity. The tank elements can be equipped with automatic monitoring devices and can be constructed at the site. (Schulz-FIRL)
W78-04571

WASTEWATER TREATMENT FOR TEMPORARY CONSTRUCTION CAMPS IN REMOTE LOCATIONS,
C. L. Eggener, and B. G. Tomlinson.
Water and Sewage Works, Vol. 124, No. 11, p 81-83, November, 1977.

Descriptors: *Treatment facilities, *Sewage treatment, *Clarification, *Coagulation, *Equipment, Activated carbon, Incineration, Centrifugation, Sludge treatment, Waste water treatment.

Stricter regulations on waste water treatment for temporary construction camps, resorts, and other seasonal facilities have led to the design of a variety of 'packaged' physical-chemical waste water treatment systems. The operation, modification, and maintenance of 36 of these system are reviewed. Waste water treatment needs for construction camps are largely dependent upon the size of the resident population and the work schedule. Typical waste water flows and characteristics are presented. Waste water normally passes via gravity sewers to rotary screens or comminutors and then to an aerated equalization tank where coarse bubble aeration provides complete mixing. Packaged physical-chemical treatment plants generally employ either powdered or granular activated carbon. Waste water flows are usually coagulated with alum and flocculated with an anionic polymer. Rough clarification, multimedia filtration, and chlorination are used to further treat the waste water before it passes to an effluent percolation lagoon. Gravity thickeners and basket centrifuges are used to dewater the remaining sludge prior to incineration. Various modifications which have been made to packaged waste water treatment systems since their inception are described. (Schulz-FIRL)
W78-04572

CHEMICAL TREATMENT AS A COST-EFFECTIVE ALTERNATIVE FOR WASTEWATER TREATMENT: OPERATING VS. CAPITAL COSTS,
Dow Chemical U. S. A., Midland, MI.
S. L. Daniels, L. N. Carmouche, and E. D. Driscoll.
AIChE Symposium Series, Vol. 73, No. 166, p 333-343, 1977. 4 fig, 6 tab, 22 ref.

Descriptors: *Costs, *Cost comparisons, *Flocculation, *Coagulation, *Capital costs, Treatment facilities, Aeration, Clarification, Sewage treatment, Municipal wastes, Economics, Waste water treatment, *Chemical treatment.

A summary of the technology, availability, environmental impact, and costs of chemical treatment as an alternative to capital expansion is presented for four secondary treatment configurations. The alternatives include: clarification (25% hydraulic overload); clarification and aeration (25% hydraulic overload and 20% organic overload); chemical treatment (flocculation); and chemical treatment (coagulation and flocculation). Since chemical treatment can be integrated with existing facilities to increase plant capacities, it has been suggested as a less costly alternative to the construction of new facilities for compliance with Public Law 92-500. Chemical treatment can also be implemented in 3-12 mos as opposed to the 36-60 mos normally required for capital expansion. However, since most costs associated with chemical treatment are incurred with daily operation and are not covered under federal funds, plant expansion has generally been favored by municipalities. Environmental impact, sludge handling, economics, capital costs, and operating costs are discussed with respect to benefits derived from chemical treatment. Chemical treatment is also described as a means of 'interim treatment' for those plants which must go to capital expansion. (Schulz-FIRL)
W78-04573

POST TREATMENT OF MOST HOSPITAL WASTEWATERS BY OZONATION FOR REUSE,
Abcor, Inc., Cambridge, MA. Walden Research Div.
K. J. McNulty, R. L. Goldsmith, and A. Z. Gollan.
AIChE Symposium Series, Vol. 73, No. 166, p 252-264, 1977. 10 fig, 2 tab, 18 ref.

Descriptors: *Ozonation, *Ozone, *Hospitals, *Water reuse, *Treatment facilities, *Reverse osmosis, *Tertiary treatment, Disinfection, Hydrogen ion concentration, Ultraviolet radiation, Filtration, Pilot plants, Sewage treatment, Design criteria, Waste water treatment.

Laboratory and pilot studies are being used to develop an advanced waste water treatment system for a mobile army field hospital. Design criteria outlined by the U. S. Army Medical Research and Development Command specified that the output capacity of the system by 4,000 gpd. Additional criteria included a waste water recovery capacity in excess of 85%, equipment which fit into two 11.5 ft x 6.5 ft x 6.75 ft containers, a weight not in excess of 6,000 lbs per container, power consumption not in excess of 30 kw, and the capability of treating all types of hospital wastes. A three-step treatment process which included ultrafiltration, reverse osmosis, and ozonation was chosen. Ozonation studies were conducted on reverse osmosis permeates of hospital composite and laboratory wastes. The studies concluded that ozonation of reverse osmosis permeates was required to insure compliance with water quality standards of 5 mg/liter TOC and 10

mg/liter COD. The ozonation reaction rate was at its maximum at intermediate temperatures of 40-50C for both hospital composite and laboratory waste. The rate of reaction was also more rapid at high pH's. The rate of reaction of ozone with dissolved organics was increased by irradiation with ultraviolet light. The free radical mechanism of ozonation was cited as the cause of these reaction rate effects. (Schulz-FIRL)
W78-04574

PYROLYZING SEWAGE SLUDGE ALONE MOVES SLOWLY TOWARD MARKET.
For primary bibliographic entry see Field 5E.
W78-04575

NEW SEWAGE TREATMENT PLANT INSTALLED.
World Dredging and Marine Construction, Vol 13, No 12, p 41, November, 1977. 1 fig.

Descriptors: *Activated carbon, *Flocculation, *Sewage treatment, *Treatment facilities, Chlorination, Organic wastes, Coagulation, Waste water treatment, *Japan.

The new physical-chemical sewage treatment system at the Nippon Kokan Tsurumi shipyard in Japan was developed by Zurn Industries, Inc., of Houston, Texas. The system is designed for the treatment of domestic sewage and is available in standard capacities of 200, 400, and 600 cu m/day. When the sewage in a wet well reaches a certain level, it is pumped to a contact chamber where activated carbon is added to absorb the organic wastes. Flocculation with sulfuric acid and polymer and separation of the solid material in a settling tank comprise the next stage of treatment. The supernatant water is chlorinated and then passed through an upflow filter before recirculation or discharge. The BOD and COD at this point in the treatment process are both less than 10 mg/liter. Although operating costs are approximately 20% higher than those of the conventional activated sludge systems, construction costs are about one-third lower and the system is not dependent upon the needs of microorganisms. (Schulz-FIRL)
W78-04576

LAGOONS GET SECONDARY TREATMENT OK.
The American City and County, Vol. 92, No. 12, p 41-42, December, 1977. 1 fig, 1 tab.

Descriptors: *Biological treatment, *Lagoons, *Operation and maintenance, *Sewage treatment, *Treatment facilities, Ambient light, Algae, Aerobic bacteria, Municipal wastes, Waste water treatment, Waste water disposal, *Sewage lagoons.

The two main problems encountered in operating waste water treatment lagoons are short-circuiting and hydraulic or organic overloading. Insufficient sunlight will kill the oxygen-producing algae, thus limiting the growth of aerobic bacteria that degrade the organic wastes. The lower part of the ponds should be sealed to prevent water from leaking out through the surrounding soil. Covering the earth berms around the lagoons with asphalt is the preferred method of preventing erosion; vegetation is usually unsuitable. The piping system should allow the operator to control flow and depth in each pond. Such a system makes it possible to rest an overloaded pond, switch between parallel and series operation, recirculate part of the effluent, control weeds, and retain all effluent during the winter. (Snyder-FIRL)
W78-04577

STATE OF THE ART IN WATER TREATMENT DESIGN, INSTRUMENTATION, AND ANALYSIS,
Kennedy Engineers Inc., San Francisco, CA.
For primary bibliographic entry see Field 5F.
W78-04578

BREATHING NEW LIFE INTO POLLUTED WATERS.
For primary bibliographic entry see Field 5G.
W78-04580

DECOMPOSITION OF SEWAGE SLUDGE COMPOST IN SOIL: I. CARBON AND NITROGEN TRANSFORMATION,
Agricultural Research Service, Beltsville, MD.
For primary bibliographic entry see Field 5E.
W78-04581

ALTERNATIVES TO DISINFECTION,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
P. E. Budde, P. Nehm, and W. C. Boyle.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2144-2156, October, 1977. 11 fig, 6 tab, 22 ref.

Descriptors: *Disinfection alternatives, *Chlorination, *Ozone, *Iodine, *Sewage bacteria, Coliforms, Costs, Pilot plants, Nitrification, Activated sludge, Sewage treatment, Filtration, Waste water treatment.

A continuous-flow pilot study was conducted for the City of Madison, Wisconsin, to compare the bactericidal effectiveness of three alternate disinfectants on secondary and more highly polished waste water effluents. The dose required to reach a target level kill of 200 fecal coliforms/100 ml was used to assess the bactericidal efficiencies of chlorine, ozone, and iodine. Cost data were prepared with respect to target level and effluent waste water quality. The waste streams tested included nitrified activated sludge, nitrified rotating film effluents, non-nitrified activated sludge, and non-limited dual-media filter effluents. Disinfectant sensitivities based on changes in turbidity were 03>I2>Cl2 for nitrified effluents and 03>Cl2>I2 for non-nitrified effluents. Chlorination was less expensive than ozonation as long as dechlorination was not required. Chlorination was adversely affected by the absence of ammonia when the turbidity exceeded 1 JTU. (Schulz-FIRL)
W78-04582

PILOT PLANT STUDY OF PHYSICAL-CHEMICAL TREATMENT,
Los Angeles County Sanitation Districts, CA.
L. S. Directo, C-L. Chen, and I. J. Kugelman.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2081-2098, October, 1977. 12 fig, 11 tab, 11 ref.

Descriptors: *Pilot plants, *Activated carbon, *Clarification, *Hydrogen sulfide, *Polymers, Treatment facilities, Organic wastes, Adsorption, Tertiary treatment, Municipal wastes, Waste water treatment, *Physical-chemical treatment.

Pilot plant studies were used to evaluate the large-scale regeneration of granular activated carbon exhausted on chemically clarified waste water. The performance of a chemical clarification system using alum and polymer was examined. Granular activated carbon was evaluated for the removal of soluble organic matter from chemically treated waste water. Techniques of hydrogen sulfide control and thermal regeneration of activated carbon were also treated. The pilot plant included a chemical clarification system followed by a single-stage, packed bed, downflow granular activated carbon column. Carbon-treated effluents during the 27-month study averaged at 13.5 mg/liter COD, 6.7 mg/liter suspended solids, 6.3 JTU turbidity, and 7.8 color units. Losses during carbon regeneration ranged 2.5-6.0%. Continuous sodium nitrate addition to the column was more effective than oxygen addition, chlorination, or air-water backwash for hydrogen sulfide control. Costs for a 10 mgd physical-chemical treatment system, designed to produce an effluent with an average total COD of 25 mg/liter, dissolved COD of 16 mg/liter, and suspended solids of 8 mg/liter, were projected at $0.07/cu m with the use of alum and polymer. (Schulz-FIRL)
W78-04583

EFFECT OF EXOCELLULAR POLYMER PRODUCTION ON THICKENING AND DEWATERING CHARACTERISTICS OF ACTIVATED SLUDGE,
V. Gulas, M. Bond, and L. Benefield.
Water and Sewage Works, Vol. 124, No. 11, p 83, November, 1977.

Descriptors: *Polymers, *Activated sludge, *Dewatering, *Microorganisms, *Sludge treatment, Flocculation, Sewage bacteria, Waste water treatment.

The bioflocculation of bacterial cells in activated sludge can affect sludge thickening and dewatering characteristics which ultimately control sludge handling requirements. The agglutination of cellular organic material produces readily settleable aggregates and also aids in overcoming biomass shearing during sludge pumping and processing. This phenomenon allows removal of the organic matter which has been oxidized by the bacterial cells. Investigations were conducted to describe the quantitative production of exocellular polymers in activated sludge during continuous operation. The mode of release of this polymeric material was also examined. Exocellular polymer concentrations were compared with the degree of thickening observed during dissolved air flotation of the sludge. The influence of naturally produced polymers on the dewatering behavior of activated sludge was evaluated. (Schulz-FIRL)
W78-04584

SYKES HANDLE PUMPEX SUBMERSIBLES.
For primary bibliographic entry see Field 8C.
W78-04587

LAND APPLICATION GUIDELINES FOR SLUDGES CONTAMINATED WITH TOXIC ELEMENTS,
Northern Virginia Community Coll., Woodbridge. Div. of Environmental and Natural Sciences.
For primary bibliographic entry see Field 5E.
W78-04588

IMPROVING SLUDGE INCINERATION AND VACUUM FILTRATION WITH PULVERIZED COAL,
Municipal Environmental Research Lab., Cincinnati, OH. Wastewater Research Lab.
S. W. Hathaway, and R. A. Olexsey.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2419-2430, December, 1977. 8 fig, 8 tab, 6 ref.

Descriptors: *Sludge disposal, *Coal, *Incineration, *Dewatering, *Filtration, Fuels, Activated sludge, Waste water treatment, Vacuum drying, Treatment facilities, Sludge treatment.

More efficient methods of filtration and combustion of primary sludge which involve the addition of pulverized coal before the dewatering process were tested. Autogenous incineration of the sludge was calculated as occurring at a 25.9% cake solids content with a stack gas temperature of 427C. Sludge is normally incinerated with the aid of supplementary fuels such as natural gas of fuel oil. The effects of adding coal to the sludge before and after dewatering were examined. Mixing coal and sludge before filtration yielded a higher solids concentration in the filter cake. Experiments with pulverized coal additions in the range of 0.1-0.4 kg/kg dry sludge solids determined that au-

togenous combustion could be achieved with the addition of 0.11 kg coal/kg dry sludge solids. For dewatering with a vacuum filter, the addition of the pulverized coal to the sludge increased filter yield or throughput. (Lisk-FIRL)
W78-04589

ENERGY FROM SLUDGE DIGESTION - A DEVELOPING RESOURCE,
Thames Water Authority, London (England).
L. Thompson.
Process Engineering, August, 1977. 2 fig, 2 tab, 6 ref.

Descriptors: *Sludge treatment, *Methane, *Sludge digestion, *Resources development, *Electric power, Treatment facilities, Municipal wastes, Carbon dioxide, Ammonia, Organic compounds, Waste water treatment.

Methane gas produced during sludge digestion in municipal waste water treatment is proposed as an alternate energy source. Methane is generated, along with carbon dioxide, ammonia, and water, as a by-product of the breakdown of complex organic compounds. This breakdown enhances dewaterability and reduces the quantity of organic solids and pathogenic organisms. Waste water treatment plants in England serving a population of more than 100,000 accelerate sludge digestion by raising the temperature in the storage tanks to 30-35C. This temperature increase improves gas production and shortens the time required for the digestion process. The methane produced by this process can be used to generate heat and electricity for treatment plant operations. Other uses have included heating of offices and greenhouses, substitutes for gasoline, refrigerating agents, incendiary bombs, and various purposes. (Lisk-FIRL)
W78-04590

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
For primary bibliographic entry see Field 5E.
W78-04591

PRECIPITATED WASTE WATER PHOSPHORUS FERTILIZERS (ABWASSERPHOSPHATE ALS DUENGEMITTEL),
Institut fuer Agrikulturchemie, Goettingen (West Germany).
L. Cervenka, and F. Timmermann.
Deutsche Gewaesserkundliche Mitteilungen, Vol. 21, No. 1, p 6-7, 1977. 9 ref.

Descriptors: *Phosphorus, *Fertilizers, *Chemical precipitation, *Biological treatment, *Nutrient removal, Soil-water-plant relationships, Waste water treatment, Municipal wastes, Lime.

The use of phosphorus precipitated from municipal waste water as a fertilizer was investigated. The precipitation of phosphorus using mechanical and biological methods resulted in only 30% removal. A 95% removal of phosphorus was realized through chemical treatment using ferric and aluminic salts or lime. These phosphorus precipitates were tested for their solubility and yielding properties. The tests were performed to gain a better understanding of the effectiveness of phosphorus precipitates from waste water as a fertilizer. Phosphorus is contributed to water through soil erosion, drainage, excrement, both animal and human, and detergents. The amount of phosphorus contributed by municipal waste water is calculated at 3-4 g/person. (Lisk-FIRL)
W78-04592

TREATMENT: NOT A THING OF THE PAST.
Water and Wastes Engineering, Vol. 14, No. 12, p 21, December, 1977.

Descriptors: *Waste water treatment, *Sewage disposal, *Municipal waste, *Treatment facilities, *North Carolina, Water pollution control, Watersheds(Basins), Pumping stations, Sludge treatment.

Waste water treatment and collection facilities, having a capacity of 30 mgd with provisions for expansion to 100 mgd, were completed in 1976 for Raleigh, North Carolina. The system was designed to serve the waste collection needs of the city through the year 2020. In 1886, Raleigh's sewer system discharged untreated waste water into the Walnut Creek and Crabtree Creek, tributaries to the Neuse River. A suit was filed against the city of Raleigh by a town whose water supply came from the Neuse River. Although the 1930's suit was dismissed, after World War II Raleigh was forced to construct sewage treatment facilities. The plant, completed in 1956, employed primary treatment, filters with secondary clarifiers, anaerobic digestors, sludge thickening and dewatering, and chlorination. Plans for the new waste water treatment facilities began in 1969 when the original system became overloaded. The treatment system, which cost over $26 million, has three sewer interceptors, two sewage lift pump stations, and a waste water treatment plant. (Lisk-FIRL)
W78-04593

SACRAMENTO REGION MOVES FAST ON WASTEWATER CLEANUP.
Engineering News-Record, Vol. 200, No. 3, p 52, January, 1978.

Descriptors: *Treatment facilities, *California, *Sewage treatment, *Projects, *Sewerage, Grants, Bond issues, Human population, Municipal wastes, Waste water treatment.

The Sacramento County Regional Sanitation District's $395-million secondary waste water treatment system is scheduled to become operational late in 1980. The federal funds for the project comprised the largest waste water treatment project grant awarded at the time. In the early 1970's, the 21 separate waste water collection and treatment systems in the Sacramento area were under pressure from the state of California to improve their treatment facilities. By late 1973, agreements were signed to construct a central plant. A $75-million bond issue was approved by a 75.5% vote in June, 1974, for a plant to serve a population of 70,000 in the 1980's. Property tax rates were immediately raised to pay off the separate agencies' $25 million in debts. Sewerage costs were also increased, and will be further increased, when the system is fully operative, to about $7 monthly for residential users. (Snyder-FIRL)
W78-04594

WATER RECLAMATION--QUALITY TARGETS AND ECONOMIC CONSIDERATIONS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W78-04597

THE EFFICACY OF INCLINED TUBE AND PLATE MODULES IN A HIGH LIME CLARIFICATION PROCESS,
National Inst. for Water Research, Pretoria (South Africa).
B. M. van Vliet.
Water Research, Vol. 11, No. 9, p 783-788, 1977. 6 fig, 5 ref.

Descriptors: *Treatment facilities, *Coagulation, *Effluents, *Tubes, *Equipment, Lime, Hydraulics, Overflow, Water reuse, Sludge, Municipal wastes, Waste water treatment.

A study was performed to ascertain whether tube and plate systems would improve the performance of a clarifier in a high lime coagulation/clarification process. The study was performed at the Stander water reclamation plant, which uses the high lime process for chemical coagulation of biofilter humus tank effluent. Sludge is produced at a rate of approximately 2000 kg dry solids per day. The use of inclined tube and plate modules in the upper part of the high lime clarifier improved the quality of the overflow. Hydraulic loading, pH, and temperature, within defined limits, had relatively little effect on the modules' performance. Flocculant dosage and clarifier turbidity strongly influenced the performance of the modules. At clarifier turbidities over three Jackson turbidity units, the modules reduced carry-over of suspended material by more than 50%. Although the modules were essentially self-cleaning, hosing and brushing down were required approximately every 3 mos. Annual acid washes were aso recommended to ensure continuous satisfactory operation. (Snyder-FIRL)
W78-04601

AUTOMATION OF WASTE WATER TREATMENT PLANTS: CONCLUSION--EXPERIENCES AND USE,
Anglian Water Authority, Norwich (England). Norwich Sewage Div.
P. Cotton.
Effluent and Water Treatment Journal, Vol. 17, No. 9, p 461-465, September, 1977. 9 ref.

Descriptors: *Activated sludge, *Biological treatment, *Sewage treatment, *Automation, *Monitoring, Treatment facilities, Municipal wastes, Europe, Equipment, Waste water treatment.

The Whitlingham works of the Norwich Sewage Division of the Anglian Water Authority have recently been extended to handle a design daily waste water flow of 55,000 cu m/day. The Whitlingham plant serves Norwich, England, and the surrounding area. Since late 1973, new plant and automatic control sequences gradually came into use. Initial problems involved preliminary treatment, primary sedimentation, the activated sludge plant, sludge pumping, sludge digestion, filter pressing, and motorized valves and penstocks. A problem with foaming in the digesters was alleviated by adjustments in operating temperature, frequency and duration of mixer operation, and frequency of feeding. Automatic control helped remedy problems associated with a dissolved oxygen deficiency and sludge bulking in the activated sludge plant. Twnety-two workers operate the automated facility, as compared with 20 before the plant capacity was doubled and automatic control sequences were installed. The power costs of preliminary and storm water treatment have also been reduced. (Snyder-FIRL)
W78-04602

SERVO CONTROLLED OPTIMIZATION OF NITRIFICATION-DENITRIFICATION OF WASTE WATER IN SOIL,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5E.
W78-04603

'USED' WATER USED AGAIN FOR IRRIGATION.
For primary bibliographic entry see Field 5G.
W78-04605

FULL-SCALE USE OF PHYSICAL/CHEMICAL TREATMENT OF DOMESTIC WASTEWATER AT ROCKY RIVER, OHIO,
Schade (Willard F.) and Associates, Inc., Cleveland, OH.
W. H. Moss, R. E. Schade, S. J. Sebesta, K. A. Scheutzow, and P. V. Beck.

Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2249-2254, November, 1977. 3 fig, 5 tab, 3 ref.

Descriptors: *Treatment facilities, *Coagulation, *Adsorption, *Physical control, *Sewerage, Domestic wastes, Pollutant identification, Sewage treatment, Biochemical oxygen demand, Chemical oxygen demand, Municipal wastes, Waste water treatment.

The municipal waste water treatment plant in Rocky River, Ohio, processes an average daily waste water flow of 37,850 cu m, using chemical coagulation and carbon adsorption. Operating data for an initial six-month period were used to evaluate performance of the chemical treatment and carbon treatment systems. Samples of influent, primary clarified effluent, and final plant effluent were analyzed for biochemical oxygen demand (BOD), chemical oxygen demand (COD), suspended solids, and phosphorus. Samples of primary raw sludge, thickened sludge, and thickener overflow were analyzed for percent solids. The effluent complied with NPDES permit standards for secondary treatment and phosphorus removal. Digested alum sludge production averaged 9.8 kg/sq m hr; raw alum sludge yield averaged 12.2 kg/sq m hr. Problems with increased chlorine demand and odor were attributed to anaerobic biological growth within the carbon columns. Sodium nitrate addition and daily backwashing with air scour were used to control hydrogen sulfide production. Operating problems included separation of the rubber lining from the walls of the column, physical deterioration of the air scour diffusers, and loss of over 20% of the total carbon volume during filtration. The operating cost was approximately $0.079/cu m. (Snyder-FIRL)
W78-04607

REVIVING THE SEPTIC TANK,
Bell Construction Co., Matteson, IL.
For primary bibliographic entry see Field 5E.
W78-04610

EFFECTS OF PH AND MIXING ON POLYMER CONDITIONING OF CHEMICAL SLUDGE,
Du Pont de Nemours and Co., Inc., Wilmington, DE.
For primary bibliographic entry see Field 5F.
W78-04611

SLUDGE TREATMENT PROCESS OFFERS FLEXIBILITY, LOW COST,
Dorr-Oliver, Inc., Stamford, CT.
R. R. Evans.
Chemical Engineering, Vol. 84, No. 26, p 86-88, December, 1977. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Treatment facilities, *Sludge treatment, Costs, Sludge, Sewage treatment, Municipal wastes, Capital costs, Centrifugation.

Split-stream thickening, in which primary and waste activated sludges are separated and concentrated independently before further processing, can result in a savings of about 15% on the capital cost of conventional sludge thickening. Primary sludge is formed when influent is detained in settling tanks; microorganisms, using the dissolved organics as an energy supply, clump together to form activated sludge in a secondary treatment step. It is difficult to accurately predict the amounts of primary and biological sludges that a given facility will produce. When primary and activated sludges are combined at various ratios, operating results will deviate significantly from the design calculations. Dewatering of primary sludge in a conventional gravity thickener and activated sludge with a high capacity centrifuge alleviates these problems. The capital and operating costs for the split-stream process are site-specific, so it is difficult to give meaningful economic data. (Snyder-FIRL)
W78-04612

APPLICATION OF SEWAGE SLUDGE TO GARDEN PLOTS,
Vermont Univ., Burlington. Dept. of Microbiology and Biochemistry.
For primary bibliographic entry see Field 5E.
W78-04613

DISINFECTION OF DRINKING WATER, SWIMMING-POOL WATER AND TREATED SEWAGE EFFLUENTS,
Health Effects Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5F.
W78-04614

IMPROVED DETERMINATION OF SPECIFIC RESISTANCE TO FILTRATION (DETERMINATION AMELIOREE DE LA RESISTANCE SPECIFIQUE A LA FILTRATION),
Institut Federal pour L'Amenagement, l'Epuration et la Protection des Eaux, Zurich (Switzerland).
K. A. Wuhrmann.
Techniques et Sciences Municipales-L'Eau, Vol. 72, No. 2, p 59-60, February, 1977. 3 fig, 1 tab, 2 ref.

Descriptors: *Filtration, *Filters, *Analytical techniques, *Sludge treatment, *Flow measurement, Automation, Water analysis, Waste water treatment.

The validity of using specific resistance as a descriptive parameter for filtration of waste sludges has been questioned because of the dispersion coefficient inherent to the method. The method could be improved by calculating the mean value from a multitude of parallel determinations. Equations are given for measurement techniques, stressing the importance of the flow gradient. Automatic measuring devices are recommended as the most accurate means of determining specific resistance to filtration. Optimization of filtration analysis has been accomplished by an instrument which can be used for filtration as well as for recording resistance data. (Blits-FIRL)
W78-04615

OPERATION AND MAINTENANCE OF POLLUTION CONTROL EQUIPMENT,
For primary bibliographic entry see Field 5G.
W78-04618

A SIMPLE SOIL PERCOLATION TEST DEVICE FOR FIELD ENVIRONMENTALISTS,
Summit County Dept. of Environmental Health, Frisco, CO.
For primary bibliographic entry see Field 5A.
W78-04619

DISCOVERY OF AN AGENT IN WASTEWATER SLUDGE THAT REDUCES THE HEAT REQUIRED TO INACTIVATE REOVIRUS,
Sandia Lab. Albuquerque, NM.
R. L. Ward, and C. S. Ashley.
Applied and Environmental Microbiology, Vol. 34, No. 6, p 681-688, December, 1977. 4 fig, 6 tab, 25 ref.

Descriptors: *Sludge treatment, *Viruses, *Ammonia, *Sludge digestion, *Anaerobic digestion, Sludge disposal, Microorganisms, Treatment facilities, Laboratory tests, Waste water treatment, *Reoviruses.

A viricidal agent contained in both raw sludge and anaerobically digested sludge was discovered and analyzed. The agent was shown to inactivate reovirus, a genus of enteric viruses found in human waste. The viricidal agent was not isolated or identified, but several of its properties were discovered through laboratory experiments. The agent was associated with waste solids but could be washed from the sludge solids with water. Viricidal activity in the sludge increased at pH 8-10 but was not observed at a pH lower than 6. The antivirus agent was assumed to be insoluble in acidic solution. Temperatures greater than 35C increased the rate of reovirus inactivation by the agent. The viricidal agent was inactivated at a temperature of 350C sustained for 30 minutes, indicating its organic nature. The antiviral qualities of the agent significantly increased in the temperature range of 45C. Heat inactivation of reovirus occurred more frequently in anaerobically digested sludge than in raw sludge. The alkaline properties of the anaerobically digested sludge were considered more conducive to the activation of the viricidal agent than the acidic nature of raw sludge. Ammonia, a compound which retards the activity of poliovirus, did not appear to be the viricidal agent as reovirus was unaffected by ammonia at 47C. The agent did not inactivate polivirus and may be the sludge component which protects poliovirus from heat inactivation. (Lisk-FIRL)
W78-04622

THE EFFECT OF TOXIC LOADS ON EFFLUENT PURIFICATION SYSTEMS,
National Inst. for Water Research, Pretoria (South Africa).
G. G. Cillie, T. R. Davies, O. O. Hart, and A. J. Hassett.
Water SA, Vol. 3, No. 2, p 83-89, April, 1977. 12 fig, 3 tab, 4 ref.

Descriptors: *Biological treatment, *Toxicity, *Sewage treatment, *Treatment facilities, *Pollutant identification, Activated sludge, Nitrification, Chemical oxygen demand, Filtration, Africa, Sewerage, Municipal wastes, Waste water treatment, Waste water disposal.

An attempt was made to correlate performance data from the Stander Water Reclamation Plant and various biological treatment plants and pilot plants at the Daspoort Sewage Works in Pretoria, South Africa, for a period in 1975 when efficiency was reduced. The deterioration in performance was attributed to the presence of toxic substances in the sewage. Unusually high concentrations of mercury, phenol, chromium, and an organophosphorus compound were detected. Any of these substances or a combination of them might have caused the reduced efficiency. Reactors which employed attached biological growth were affected more than the extended aeration activated sludge processes. Biofilter effluents had high bacterial counts due to encystation by peritrichous ciliates. Nitrification, which declined rapidly during late July and early August, was still not recovered completely by the middle of October. The effect on COD removal was more limited. Biological treatment following lime flotation was unaffected, suggesting that prior lime addition protected the biological processes. The high quality of the water from the Stander Water Reclamation Plant remained the same, even when the quality of influent from the biological treatment facilities was not substantially improved over that of settled sewage. (Snyder-FIRL)
W78-04623

INVESTIGATION OF FILL AND BATCH PERIODS OF SEQUENCING BATCH BIOLOGICAL REACTORS,
Notre Dame Univ., IN. Dept. of Civil Engineering.
R. L. Irvine, T. P. Fox, and R. O. Richter.
Water Research, Vol. 11, No. 8, p 713-717, 1977. 5 fig, 1 tab, 5 ref.

Descriptors: *Biological treatment, *Organic wastes, *Treatment facilities, *Flow control, *Sedimentation, Operations, Volume, Continuous flow, Municipal wastes, Waste water treatment.

Operational difficulties with sequencing batch biological reactors have led to the more widespread use of continuous flow, constant volume treatment systems. Improvements in process control and the need for more reliable and consistent treatment have led to the need for a re-evaluation of biological treatment practices. Sequencing batch reactors provide equalization of flow and concentration, treatment of organics, and quiescent sedimentation. Reductions in volume are also expected from plug flow systems. Laboratory studies were performed to study waste removal, organism growth, and oxygen supply during the fill and batch phases of biological treatment. A mathematical model was derived for calculation of the waste and organism concentration and oxygen uptake rate with respect to time. Measured and predicted values agreed well. These results suggested that fill and draw reactors may provide a visible alternative to continuous flow treatment schemes. (Snyder-FIRL)
W78-04625

INTERACTIVE COMPUTER DESIGN OF WASTEWATER PLANTS,
Herkenhoff (Grodon) and Associates, Inc., Albuquerque, NM.
For primary bibliographic entry see Field 7C.
W78-04626

A MODEL FOR THE SIMULATION OF RAIN-WATER RUNOFF IN SEWERS (EIN MODELL ZUR SIMULATION DES REGENABFLUSSES IN KANALISATIONSNETZEN),
Balzari Blaser Schudel, Ingenieure und Planer, Bern (Switzerland).
For primary bibliographic entry see Field 5B.
W78-04627

THE MODELING OF ACTIVATED CARBON ADSORBERS IN THE PRESENCE OF BIO-OXIDATION,
McMaster Univ., Hamilton (Ontario).
R. Peel, and A. Benedek.
AIChE Symposium Series, Vol. 73, No. 166, p 25-35, 1977. 13 fig, 13 ref.

Descriptors: *Activated carbon, *Biodegradation, *Adsorption, *Model studies, *Sewage treatment, Sewage bacteria, Pilot plants, Treatment facilities, Clarification, Municipal wastes, Organic loading, Porous media, Waste water treatment.

An activated carbon adsorption model which considers the effects of biological activity within the column is presented. The fact that substances introduced to the column may or may not be biodegradable and/or adsorbable has been considered. Input parameters required for the model include: bulk liquid and bacterial film diffusivities, particle diffusion coefficient, liquid phase mass transfer coefficient, bacterial film thickness, bacterial reaction rate, and the estimation of residual yield factor. Pilot plant data on physical-chemical treatment at the Dundas Water Pollution Control Center in Ontario, Canada, the Ewing-Lawrence Sewage Authority plant in New Jersey, and the Los Angeles County Sanitation Districts Advanced Waste Treatment Research Facility in Pomona, California, were simulated to test the model's validity. The specific biological reaction rates calculated for the three plants had a mean of 5.59 x 10 to the minus tenth g TOC/sq cm-sq with a standard deviation of 1.53 x 10 to the minus tenth g TOC/sq cm-sec. (Schulz-FIRL)
W78-04628

A PHYSICAL AND MATHEMATICAL MODEL OF MASS TRANSFER AND REACTION KINETICS OF OZONATION,
Anderson-Nichols and Co., Boston, MA.
S. B. Majumdar, W. H. Ceckler, and O. J. Sproul.
AIChE Symposium Series, Vol. 73, No. 166, p 188-205, 1977. 7 fig, 7 tab, 11 ref.

Descriptors: *Ozonation, *Mathematical models, *Ozone, *Oxidation, *Model studies, *Kinetics, Transfer, Chemical reactions, Waste water treatment.

Since the exact mechanism of ozonation has not yet been established, a discussion is presented to delineate the fundamentals of ozonation with respect to mass transfer and reaction kinetics. A theoretical model which is presented assumes a first order relationship between the rate of mass transfer and the difference in the bulk phase concentration of ozone. A two-step process is assumed for the model. Ozone is first transferred from gas to liquid by a mass transfer process which is not dependent upon chemical reaction. The chemical reaction between ozone and the waste material then proceeds without regard to mass transfer. Expressions for mass transfer of ozone from the gas phase to the liquid phase are derived with respect to a counter-current bubble column. The reaction rate constant and the order of the reaction are defined for the reaction of ozone with the dissolved and suspended substances in waste water. Results of kinetic studies on primary and secondary waste waters are presented. Bubble size, interfacial area, and residual ozone concentrations were determined in the studies. (Schulz-FIRL)
W78-04629

ACTIVATED SLUDGE-UNIFIED SYSTEM DESIGN AND OPERATION,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
T. M. Keinath, M. D. Ryckman, C. H. Dana, and D. A. Hofer.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE5, p 829-849, October, 1977. 11 fig, 2 tab, 19 ref, 1 append.

Descriptors: *Activated sludge, *Analytical techniques, *Sedimentation rates, *Treatment facilities, *Design, Biological treatment, Operation and maintenance, Evaluation, Aeration, Waste water treatment.

The settling flux approach can be adapted for evaluating economic tradeoffs between alternative designs for waste water treatment systems. The design basis for the aerator incorporates solids residence time and hydraulic residence time. The design basis for the clarifier incorporates the clarification constraint, and a recycle rate constraint. This methodology can be used for evaluating the economic aspects of an activated sludge system consisting of an aeration basin, clarifier, and sludge processing equipment. The settling flux approach can also be used in operations monitoring of an activated sludge system. This approach indicates that increased hydraulic flow rates would only cause solids to enter the effluent at certain critically located state points near the settling flux curve. For decreased hydraulic flow rates, the recycle rate could be reduced to the point of critical loading. The settling flux approach indicates that flow proportional recycle controls can estimate the required flow fairly accurately. It does not, however, provide the precise recycle rate required to maintain the clarifier in a critically loaded condition. This approach can also establish the hydraulic surge that a system could accommodate without indiscriminate solids wasting. This approach can only be used for operations monitoring and control if current settling flux curves are available. Changes in the operational set-point of solids residence time can be accomodated by changes in the solids wasting program. (Snyder-FIRL)
W78-04630

EFFECTS OF EXTERNAL MASS TRANSFER AND INTRAPARTICLE DIFFUSION ON ADSORPTION RATES IN SLURRY REACTORS,
Williams and Works, Grand Rapids, MI.
A. P. Mathews, and W. J. Weber, Jr.
AIChE Symposium Series, Vol. 73, No. 166, p 91-98, 1977. 13 fig, 6 ref.

Descriptors: *Activated carbon, *Adsorption, *Model studies, *Mass transfer, *Diffusion, Equilibrium, Chemical reactions, Separation techniques, Water treatment, Waste water treatment, Slurries.

Studies were conducted to evaluate the relative effects of liquid and solid phase transport rates on the overall adsorption rate of carbon in slurry reactors. The effects of external mass transfer, unsteady state surface diffusion in the particle, and nonlinear adsorption isotherms were considered. The results of the study indicated that, in general, film diffusion controls the solute uptake rate in the initial stages, followed by particle diffusion in the latter stages. The initial uptake rates predicted by an adsorption model were compared with those of film diffusion-controlled adsorption. Negligable intraparticle diffusion resistance was considered a valid assumption for the initial adsorption period, in the case of solutes having large solid-to-liquid phase equilibrium solute distribution. However, the errors were considered substantial beyond the first few minutes, especially at a high agitation power input. The effect of variation in the external mass transfer resistance on the concentration/time profile was examined for four solutes. At the same agitation speed, solutes having a high solid-to-liquid phase equilibrium solute distribution appeared to be more sensitive to the external mass transfer resistance. Substantial deviations in profiles were illustrated for variations of 20-30% in the mass transfer coefficient. (Baker-FIRL)
W78-04631

MODELS FOR BATCH MIXING IN AIR AGITATED TANKS,
Windsor Univ., (Ontario). Dept. of Chemical Engineering.
W. Akhtar, and G. P. Mathur.
AIChE Symposium Series, Vol. 73, No. 167, p 6-14, 1977. 8 fig, 14 ref.

Descriptors: *Aeration, *Diffusion, *Mixing, *Circulation, *Model studies, Design criteria, Testing, Waste water treatment.

Efforts to develop a mathematical model to describe mixing in a batch aerated rectangular tank are described. Variations in the air flow rate and tank dimensions were used to test the model. The model for batch mixing is based on a two-dimensional description of the mixing phenomenon. Results of 17 experimental runs indicate that the vortex model for predicting mixing characteristics of an air-agitated tank provides an extension to computer models used for mixer design. Measurements of surface and bottom velocities at the mid-length of the tank are required by the model for estimation of the necessary velocities and diffusion coefficients. Extension of the approach to geometries other than the rectangular one used in the study is suggested. (Baker-FIRL)
W78-04632

MAPPING THE LAG PHASE AND BOUNDING THE GROWTH PHASE IN FERMENTATION REACTIONS,
Vanderbilt Univ., Nashville, TN.
R. D. Tanner, A. C. Loo, J. L. Shisler, M. W. Reed, and R. D. Rowlett.
AIChE Symposium Series, Vol. 73, No. 167, p 55-65, 1977. 8 fig, 19 ref, 4 append.

Descriptors: *Fermentation, *Model studies, *Mathematical models, *Microorganisms, *Growth rate, Biological treatment, Enzymes, Equations, Waste water treatment.

An analytical expression has been derived for the initial transient domain (lag phase) of fermentation reactions, such as those which occur in the sludge fermentors used for liquid waste treatment.

Parameters for gluconic acid fermentation were estimated to a first approximation. A fermentation was applied to mixed culture fermentation in liquid waste treatment. Used in conjunction with in vitro enz yme data for the glucose-gluconolactone-gluconic acid network, the approximation procedure was suggested as an efficient and feasible method of identifying a substrate-limited fermentation model. Examination of the complementary logarithmic-growth phase, typically described by a hyperbolic equation relating substrate concentration to specific cell growth rate, indicated that the lower bound for a simplified mass action fermentation kinetic model was defined by the Monod equation. The upper bound was defined by a hyperbolic quasi-equilibrium counterpart of the Monod equation. These boundaries are analogous to the Briggs-Haldane and Michaelis-Menten relationships, respectively, for the single intermediate enzyme reaction. (Baker-FIRL)
W78-04633

A DYNAMIC KINETIC MODEL OF THE ACTIVATED SLUDGE PROCESS,
Measurex Corp., Cupertino, CA.
L. M. Chase.
Biotechnology and Bioengineering, Vol. 19, No. 10, p 1431-1447, October, 1977. 7 fig, 11 ref.

Descriptors: *Mathematical models, *Activated sludge, *Enzymes, *Model studies, Sludge treatment, *Biological treatment, Kinetics, Sewage bacteria, Waste water treatment.

A kinetic model for the activated sludge process based on the assumption that the rate of metabolism is primarily controlled by the enzyme concentration in the biological mass is presented. Four hypotheses for substrate utilization are described. A differential equation for the substrate concentration is derived and equilibrium conditions are defined. Solutions to the equations are presented for three feed functions which define a step decrease, a step increase, and an instantaneous change in the feed rate. Laboratory experiments with activated sludge were conducted to test the theoretical model's ability to predict substrate utilization in terms or CO2 production. Correspondence between the experimental results and the model calculations was favorable with respect to a yield factor. (Schulz-FIRL)
W78-04634

ABSORPTION AND DECOMPOSITION OF OZONE IN AQUEOUS SOLUTIONS,
Mississippi State Univ., Mississippi State.
C. H. Kuo, K. Y. Li, C. P. Wen, and J. L. Weeks, Jr.
AIChE Symposium Series, Vol. 73, No. 166, p 230-241, 1977. 10 fig, 22 ref.

Descriptors: *Waste water treatment, Analytical techniques, *Absorption, *Chemical reactions, *Ozone, Aqueous solutions, Municipal wastes, Kinetics, Hydrogen ion concentration, Equations, *Decomposition.

A stopped-flow spectrophotometer system was used to study kinetics of the decomposition of ozone in aqueous solutions. Experiments were conducted at 15, 25, and 35C over a pH range of 2.2-11.0. The kinetics of ozone decomposition were found to follow a three-halves order relationship with respect to ozone concentration. The decomposition rate increased with the pH of the aqueous solutions. Differential equations governing molecular diffusion and decomposition in the ozone absorption process were solved by finite difference techniques. Absorption experiments were conducted utilizing a gas-liquid contacting reactor equipped with a gas disperser. The experimental data and theoretical results agreed in predicting build-up of absorbed ozone in an aqueous solution. They also indicated that it might be difficult to achieve a saturation concentration of absorbed ozone in an aqueous solution because of ozone depletion by decomposition during absorption. Ozone absorption under acidic conditions and at a moderate-to-fast gas flow rate was recommended for a high degree of ozone utilization. (Snyder-FIRL)
W78-04636

MASS TRANSFER COEFFICIENTS FOR THE OZONE-WATER SYSTEM,
Louisville Univ., KY.
D. A. Richards, M. Fleischman, and L. P. Ebersold.
AIChE Symposium Series, Vol. 73, No. 166, p 213-224, 1977. 5 fig, 7 tab, 8 ref.

Descriptors: *Model studies, *Ozone, *Mass transfer, *Absorption, *Mathematical models, Municipal wastes, Oxidation, Treatment facilities, Effluents, Waste water treatment.

An 0.75 in-diam static mixer with 42 elements was used in studies on the ozonation of secondary effluents. Within 2-7 sec, the static mixer reduced COD and bacteria to the same extent as a Welsbach reactor could in 22 min. This suggested that ozonation of waste water was controlled by mass transfer. To examine the mass transfer characteristics in the absence of chemical reaction, a 2-4% by weight ozone-oxygen gas mixture was contacted with water in a 0.25 in-diam static mixer having 21 elements housed in a horizontal glass tube. The ozone balance between the two phases was measured according to the quantity of ozone absorbed in water. The mass transfer coefficient for static mixing was at least twice that obtained without mixing for all combinations of flow rates tested. Overall mass transfer coefficients were related to the void fraction and Reynolds number. At low liquid flow rates, significant power loss was produced as a result of an increase in gas flow rate, although the mass transfer coefficient was relatively unchanged. Liquid phase resistance was found to be greater than gas phase resistance. (Synder-FIRL)
W78-04637

DYNAMIC SIMULATION OF CONTINUOUS SEDIMENTATION,
Diamond Shamrock Co., Painesville, OH.
U. Attir, M. M. Denn, and C. A. Petty.
AIChE Symposium Series, Vol. 73, No. 167, p 49-54, 1977. 3 fig, 1 tab, 9 ref.

Descriptors: *Waste water treatment, Analytical techniques, *Treatment facilities, *Model studies, *Simulation analysis, *Sedimentation, Municipal wastes, Mathematical models, Entropy, Equations.

The assumption that only discrete layers of constant concentration and underflow rate exist in continuous sedimentation may not always be valid. The Chi-Howell model for settler dynamics in extended to account for continuous concentration variations with height in place of unallowable discontinuities. Discontinuous, layered solutions must sometimes be excluded because of Lax's generalized entropy condition, the generalized entropy condition for the partial differential equations describing the dynamics of the process. When this happens, a series of discrete layers which span the concentration range is inserted. The removal of unallowable concentration discontinuities can have a major effect on the simulated process dynamics and the dynamics and control system design for the integrated waste water treatment process. (Snyder-FIRL)
W78-04638

RECYCLING SEWAGE THROUGH PLANT COMMUNITIES,
Marine Biological Lab., Woods Hole, MA.
For primary bibliographic entry see Field 5E.
W78-04639

MAINE WASTEWATER TREATMENT PLANT OPTS FOR SOLAR HEATING.
Water and Sewage Works, Vol. 124, No. 11, p 72, November, 1977.

Descriptors: *Design, *Treatment facilities, *Heating, *Solar radiation, *Cooling, Equipment, Temperature control, Construction materials, Structural design, Waste water treatment, *Maine.

The design for the rook and parts of the walls of the waste water treatment plant in Ellsworth, Maine, includes passive solar collector panels constructed of aluminum and translucent fiberglass. The ten sliding roof panels allow solar heat and light to enter the building and also provide natural ventilation during the summer months. Land costs, the effect of the location on construction and operating costs, topography, soils, environmental impact, influence on property values, and multiple site utilization were all considered before the plant's location was finalized. A town-owned, waterfront parcel in a residential area was selected for the plant. Because of the plant's compact design a recreational area will also be situated at the site. Heating costs are being minimized by the use of a system which differentially supplies heat to areas occupied only by mechanical equipment and those occupied by plant personnel. The solar collector panels were manufactured by the Kalwall Corporation of Manchester, New Hampshire. (Schulz-FIRL)
W78-04640

BALANCE IN TRAINING FOR LATIN AMERICAN WATER AND WASTEWATER UTILITIES,
Pan American Health Organization, Lima (Peru).
For primary bibliographic entry see Field 5F.
W78-04641

EVALUATING WASTEWATER FACILITY STAFFING NEEDS,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, CA.
For primary bibliographic entry see Field 5G.
W78-04642

ENVIRONMENTAL PROBLEMS OF INDIA AND THEIR POSSIBLE TRENDS IN FUTURE,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 5G.
W78-04643

SEWERAGE COSTS RISING AT A FASTER PACE.
For primary bibliographic entry see Field 5G.
W78-04644

COMMUNITY ACTION ON WATER POLLUTION,
Cook Coll., New Brunswick, NJ. Dept. of Human Ecology.
For primary bibliographic entry see Field 5G.
W78-04645

PHOSPHATE PROBLEMS COME TO THE UNITED KINGDOM,
F. W. Roberts.
Effluent and Water Treatment Journal, Vol. 17, No. 11, p 599-600, November, 1977.

Descriptors: *Phosphates, *Sewage treatment, *Coagulation, *Sewage effluents, *Nuisance algae, Detergents, Biological treatment, Nitrogen, Phosphorus, Europe, Municipal wastes, Waste water treatment, Waste water disposal, *United Kingdom.

Nitrogen and phosphorus in effluents will stimulate plant growth, causing eutrophication of

receiving waters. There is also a possibility of adverse health effects due to nitrates. Since plant growth requires a number of nutrients, limiting the supply of one element will limit algal proliferation. Limiting phosphate is considered the most economical option because most phosphate can be traced to sewage effluent, while much of the nitrate is contributed by drainage from agricultural land. The Anglian Water Authority reported severe algal growth, attributed to high phosphate levels, in one of their reservoirs. Nitrilo-triacetic acid (NTA) could be used as a substitute for tripoliphosphate in detergents. Because of health objections to NTA, chemical coagulation will probably be used to remove phosphates from sewage. The coagulants can be added during primary sedimentation, during biological treatment, or during tertiary treatment. Ferrous sulfate added during biological treatment will be oxidized to ferric sulfate, which has superior properties in phosphate removal. (Snyder-FIRL)
W78-04647

CALIFORNIA TAKES HALTING LEAD ON SEWAGE PLANT CM.
For primary bibliographic entry see Field 5G.
W78-04648

EPA HALTS AWARD.
For primary bibliographic entry see Field 5G.
W78-04650

SEWER USE CHARGE SURVEY REVEALS WIDELY DIVERGENT POLICIES,
Charlotte/Meklenburg Utility Dept. Charlotte, NC.
For primary bibliographic entry see Field 5G.
W78-04651

REGIONAL WATER QUALITY PLANNING: A VIEW FROM SOUTHEAST MICHIGAN,
For primary bibliographic entry see Field 5G.
W78-04652

EPOXY COATED GRATING RESISTS CORROSION IN SEWAGE PLANT APPLICATION,
For primary bibliographic entry see Field 8G.
W78-04654

KANSAS TREATMENT PLANT USES SUBSURFACE INJECTION OF SLUDGE,
Black and Ventch, Consulting Engineers, Kansas City, MO.
R. E. Strain.
Water and Sewage Works, Vol 124, No 11, p 42-44, November, 1977. 2 fig, 1 tab, 1 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Sewage treatment, *Sewerage, *Treatment facilities, *Kansas, Injection, Sludge, Sludge disposal, Land use.

Design features of the Manhattan, Kansas, municipal waste water treatment plant include subsurface injection of sludge on farmland, preloading of the poorly consolidated soils, no primary sedimentation, and duplication of power supply and treatment components. The fill material excavated during construction of underground structures at the sludge injection site was used in levees for the storm water lagoon. The activated sludge plant and an interceptor sewer were constructed near a flood control levee on the Kansas River. Wet weather flows in excess of the design maximum dry weather flow are pumped to a storm-water settling basin. After excess flows subside, the storm water is returned to the plant for treatment. The treatment system includes an aerated grit removal basin, two comminutors, two aeration basions, two final sedimentation basions, and two chlorine contact basins. Waste sludge is piped to the center of each 16-acre sludge disposal tract at the 120-acre site. A hose carries the sludge to the tractor-pulled subsurface injector. Construction costs of the treatment plant and sludge handling and injection equipment were approximately $7,220,000. (Snyder-FIRL)
W78-04655

POLLUTED WATER PURIFICATION,
Phillips Petroleum Co., Bartlesville, OK. (Assignee).
E. O. Box, Jr., and F. Farha, Jr.
United States Patent 4,062,772. Issued December 13, 1977. Official Gazette of the United States Patent Office, Vol. 965, No. 2, p 637, December, 1977.

Descriptors: *Organic wastes, *Aeration, *Manganese, *Bismuth, *Patents, Oxidation, Water reuse, Chemical reactions, Catalysts, Waste water treatment.

A patent has been issued for a treatment process to be used with waste water containing dissolved and suspended organic material. The waste water in contacted with an oxygen-containing gas and a catalyst, at temperatures and oxygen levels suitable for the oxidation of the organic materials. The catalyst is in the form of a solid copper manganite spinel structure promoted with bismuth. The Cu:Mn atomic ratio is in the range of 0.25:1-4:1; the Bi:Mn ratio ranges 0.003:1-0.5:1. the process converts the organic wastes into innocuous materials and yields a potable aqueous product which can be safely discarded or reused. (Schulz-FIRL)
W78-04700

5E. Ultimate Disposal Of Wastes

LEACHATE PRODUCTION AT SANITARY LANDFILL SITES,
Ayres (Owen) and Associates, Inc., Eau Claire, WI.
For primary bibliographic entry see Field 5B.
W78-04201

GEOCHEMICAL EFFECTS OF RECHARGING THE MAGOTHY AQUIFER, BAY PARK, NEW YORK, WITH TERTIARY-TREATED SEWAGE,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-04261

REPORT OF THE LAND DISPOSAL OF SLUDGE SUBCOMMITTEE PROJECTS CONDUCTED 1971 - 1978,
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 70, 1977. 62 p.

Descriptors: *Sewage, Sewage sludge, *Sewage disposal, *Heavy metals, *Agricultural chemicals, Land, Disposal, Chemicals, Chemical wastes, Lysimeters, Sampling, Parasites, Polychlorinated biphenyls, Canada, *Enteroviruses, *Sewage sludge utilization, *Sludge handling and disposal.

This report is an account of the Land Disposal of Sludge Subcommittee between 1971 and 1978, one of the subcommittees of the Canada-Ontario Agreement Research Program for the Abatement of Municipal Pollution. The report contains project summaries on the following: (1) Examination of sewage and sewage sludge for enteroviruses; (2) heavy metals in agricultural lands receiving chemical sewage sludges; (3) land disposal of sewage sludge; (4) chemical sewage sludge disposal on land - lysimeters; (5) sewage sludge interactions with soil materials; (6) biochemical characteristics of digested chemical sewage sludges; (7) Land application of sewage sludge under adverse conditions; (8) development of an efficient sampling strategy to characterize digested sludges; (9) investigation of parasites in sewage sludge sludge; (10) survey of Ontario sludge disposal practices; (11) determination of existing levels of PCB's and heavy metals at selected sludge disposal sites in Ontario. (WATDOC)
W78-04351

REUSE OF WASTE S02 AND PHOSPHATE SEWAGE SLUDGES BY SOLIDIFICATION WITH LIME AND FLY ASH.
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 5D.
W78-04360

CHEMICAL SEWAGE SLUDGE DISPOSAL ON LAND (LYSIMETER STUDIES) VOLUME 1,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
V. K. Chawla, D. N. Bryant, D. Liu, and D. B. Cohen.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 67, 1977. 98 p, 5 fig, 62 tab, 35 ref, 2 append.

Descriptors: *Lysimeters, *Sewage sludge, *Sewage disposal, *Chemicals, *Chemical wastes, Agriculture, Soils, Soil chemistry, Soil analysis, Testing, Crop production, Crop response, Orchardgrass, Plant tissues, Leachate, Microbiology, Analysis, Bacteria, Metals, Nitrogen, Potassium, Methodology, *Chemical sludge, Experimental design, Experimental facilities.

A lysimeter project using two typical Ontario agricultural soils was initiated in October, 1972 at the Wastewater Technology Centre, Burlington. The experiment was designed as a randomized block of 22 treatments (11 fertility treatments to each soil). These 22 treatments were replicated three times for a total of 66 lysimeters. The 11 fertility treatments consisted of three chemical sludge types (alum, iron and lime) each at three application rates, plus two controls (with and without NPK fertilizer). Cumulative sludge application rates at the end of 1974 were 700, 1400, and 2100 kg TKN per ha. Orchard grass was planted in the lysimeters in May, 1973 with subsequent grass harvests monitored for total dry matter yield, plant tissue chemical concentrations and uptakes. Leachate volumes, chemical constituents, and losses were determined, as were microbial concentrations in sludge, leachate, and soil. Chemical constituent material balances were calculated for each treatment. Increasing rates of sludge application up to a cumulative loading of 2100 kg TKN per ha produced increased yields. The highest grass yields in both 1973 and 1974 were obtained from the iron sludge at the highest application rate. Potassium concentrations in plants grown on 1974 in loamy sand were deficient (less than 1.0 percent K) at the higher sludge loading rates. Concentrations of N, P, Ca, and Mg were adequate, while Zn, Cu, Ni, Cr, Pb, and Cd concentrations were within their respective normal ranges. Of those leachate chemical constituents for which standards are available, Ca, Mg, Fe, Cu and Zn were within acceptable drinking water limits. (WATDOC)
W78-04361

LAND DISPOSAL OF CHEMICAL SLUDGE,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
J. T. Novak, and D. M. Sievers.
Available from the National Technical Information Service, Springfield VA 22161 as PB-277 989, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, July 30, 1977. 60 p, 22 fig, 7 tab, 21 ref. OWRT B-113-MO(3), 14-34-0001-6093.

Descriptors: *Waste disposal, *Land disposal, *Waste water disposal, Sludge, Lime sludge, Land utilization, Waste utilization, Soil properties, Alum sludge, Powerplant sludge, Fly ash, Slurries, *Sludge disposal, Water treatment, Soil treatment, Application rates.

Land disposal of chemical slurries generated from water treatment and power generation was investigated. Tests were conducted using soil columns of varying sizes and sludge was applied at several application rates. Most sludges cause no detrimental effects on soil structural properties. Most sludges were beneficial to soils, raising the pH and making the soils more workable. Only alum sludge was detrimental and only slightly so. Lime sludge from water treatment was an acceptable substitute for agricultural limestone.
W78-04371

PACKAGE PLANT FOR SLUDGE DISPOSAL.
Journal of the Institution of Engineers, Australia, p 25, October 9, 1977.

Descriptors: *Sludge disposal, *Asbestos cement, *Industrial wastes, *Waste water treatment, *Recirculated water, Cellulose, Silica, Cements, Separation techniques, Sludge treatment, Filtration, Centrifugation, Evaporation, Australia.

A system for the treatment and disposal of waste produced by an asbestos cement factory is described. The treatment plant, designed by Warman International, Ltd. of Australia, removes asbestos fiber, cellulose, ground silica, and cement from water which is eventually reused. Water is removed by a center shaft thickner which has an underflow discharge design. The thickener underflow is then dewatered by vacuum filtration, centrifugation, or evaporation. Vacuum filters are used when the waste contains fibrous or granular materials; clay-sized particles are removed through centrifugation or in evaporation ponds. After the solid filter cake produced by the filter is discharged, the filtrate is returned to the thickener. The system has a capacity of 41-273 cu m/day of effluent containing 0.1- 5.0% solids by weight. (Lisk-FIRL)
W78-04384

THE 'FIRE' NEXT TIME.
Environmental Science and Technology, Vol 12, No 2, p 134-136, February, 1978.

Descriptors: *Incineration, *Chemical wastes, *Chemical industry, *Oil industry, *Toxins, Waste water treatment, Municipal wastes, Industrial wastes, Treatment facilities, Pesticides.

A survey of liquid waste incinerator manufacturers focused on the current and future incinerator market, incinerator technology, and the long-range effects of pollution control regulations. Liquid waste incinerators, used in the disposal of toxic and hazardous wastes, are primarily purchased by chemical and petrochemical industries, municipal and federal treatment facilities, and industries producing toxic sludge or slurries. Companies which were surveyed anticipated combinations of existing incinerator designs for more effective and refined waste disposal rather than technological innovations. Incineration was considered the more durable method of reducing toxic waste to noxious material as pollution regulations become stricter. Experimental projects conducted by incinerator manufacturers showed that 100% destruction of Kepone pesticide residues and vapors could eventually be achieved at temperatures of 1000 F and 1900 F, respectively. The possibility of using wastes of one type in the treatment of other wastes or as an energy source for incineration was suggested. (Lisk-FIRL)
W78-04385

EFFLUENT TREATMENT IN MEAT AND POULTRY PROCESSING INDUSTRIES,
Alwatech Ltd., High Wycombe (England).
For primary bibliographic entry see Field 5D.
W78-04393

FOOD FROM WASTE.
Effluent and Water Treatment Journal, Vol 17, No 11, p 571, November, 1977.

Descriptors: *Food processing, *Effluents, *Fermentation, *Recycling, *Biochemical oxygen demand, Carbohydrates, Nutrient removal, Proteins, Industrial wastes, Waste water treatment.

A contract was awarded by a leading confectioner in England to Farrow Effluent Engineering Ltd. of Spalding, England, to design, supply, and construct a system for the treatment of waste water produced during their manufacturing process. The Farrow process is designed to produce a valuble byproduct, in the form of a single cell protein, from effluents containing a high concentration of carbohydrates. This protein byproduct can be used as a supplement in animal feeds. The process includes equalization, nutrient addition, pasteurization, and sterilization as required, prior to the injection of a yeast culture. A selected culture fermentation process is used to reduce the COD of the effluent under controlled pH and temperature conditions. Spray drying of the treated effluent is expected to yield 300-400 tons/yr of the protein byproduct. (Baker-FIRL)
W78-04394

RECOVERY OF WATER FOR RE-USE.
For primary bibliographic entry see Field 5D.
W78-04395

POLYETHYLENE PIPELINE CARRIES TREATED BALLAST FOR UNDERWATER DISCHARGE.
World Dredging and Marine Construction, Vol. 13, No. 13, p 32-34, December, 1977. 1 fig.

Descriptors: *Oil pollution, *Alaska, *Pipelines, *Discharge lines, *Plastic pipes, Oil pollution, Oily water, Waste water treatment, Industrial wastes, Earthquakes, Seismic waves, Structural stability, Settling basins, Construction materials.

The treatment and discharge of seawater ballast from oil tankers is described. The ballast is carried by the tankers that come into Port Valdez, Alaska, for oil shipments. The seawater ballast is pumped onshore into storage tanks where the water settles and oil residues are skimmed. The ballast is then cleaned and transferred to holding ponds. A 48 in-diam polyethylene pipe was laid along the floor of the harbor in 60-ft lengths connected by butt-fuse joints and steel flanges. The treated ballast is pumped through the pipe and discharged at a point about 1,000 ft offshore and 242 ft below the surface. The polyethylene pipeline is designed to withstand earthquakes, seismic sea waves, low temperatures and chemical corrosion. The pipeline transports up to 33.6 mgd of treated ballast. (Lisk-FIRL)
W78-04402

PULP AND PAPER MILL SLUDGE IN FIBRE BOARD,
Norwegian Pulp and Paper Research Inst., Oslo.
G. Rodland, and K. Helge.
Norsk Skogindustri, Vol. 31, No. 10, p 258-263, 1977. 9 fig, 3 tab, 5 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Recycling, *Sludge disposal, *Construction materials, Fibers(Plant), Industrial wastes, Sludge treatment, Waste water disposal.

Laboratory- and full-scale experiments at the Norwegian Pulp and Paper Research Institute examined the use of waste fibers from pulp and paper mills for the production of fiber board. The results of these studies indicated that the fibrous sludge could be used to supplement raw material for different kinds of fiber boards. Sludge addition did not significantly affect the fiber board quality. Although sludge addition did not increase waste water treatment requirements, process modifications were required in some instances. When clay-containing sludge was added, some alterations were required in the suction and press parts of the forming machine. Without a reinforced middle layer, the hot pressing time had to be increased for the manufacture of 12 mm semihardboard containing 6-7% sludge. Pitch-containing sludge from a sulfite mill seemed to be well suited as additional pulp for insulating board. Good surface properties were obtained when sulfide sludge comprised 50% of the insulating board's surface layer. (Baker-FIRL)
W78-04404

INCINERATION OF TANNERY WASTE,
Jones and Beach Engineers, Inc., Stratham, NH.
B. H. Jones.
The Leather Manufacturer, Vol. 94, No. 12, p 26-27, December, 1977. 1 tab.

Descriptors: *Incineration, *Chromium, *Tanneries, *Metals, *Adsorption, *Treatment facilities, *Industrial wastes, Sludge treatment, Sludge disposal, Recycling, Waste water treatment, Waste treatment.

An incineration process which recovers chromium in a totally hexavalent state from chromium hydroxide treatment plant sludges and/or leather tannery solid wastes is described. The process does not volatilize the nitrogen compounds, thus avoiding corrosion problems that have occurred with other recovery processes. This process includes: the controlled incineration of all chromium bearing waste from a tannery, both liquid and solid; conversion of virtually all the chromium into a hexavalent form; and solvent extraction of the hexavalent chromium from the ash. Substantial quantities of solid tannery waste are burned in a furnace at a relatively low, controlled temperature between 800 and 1200F. Sufficient alkali is introduced to oxidize the majority of the chromium in the ash to hexavalent chromium; the gases are subjected to further oxidation. The ash contains 10-30% hexavalent chromium which is soluble in both water and acid solutions. The resulting chromate ore produced may be easily handled by chemical companies experienced in chromium processing. Experience with the process at the Newburyport Tanning Company in Newburyport, Massachusetts, and at the Saco Tanning Company in Saco, Maine, are presented. (Baker-FIRL)
W78-04409

VALDEZ OUTFALL LINE IS EARTHQUAKE-PROOF.
Sea Technology, Vol. 18, No. 10, p 24-25, October, 1977.

Descriptors: *Oil pollution, *Alaska, *Pipelines, *Discharge lines, *Plastic pipes, Oil pollution, Oily water, Waste water treatment, Industrial wastes, Earthquakes, Seismic waves, Structural stability.

The discharge of treated ballast into Port Valdez harbor in Alaska through the world's largest polyethylene pipe is discussed. The pipeline, which transports treated seawater ballast from oil tankers from the onshore treatment site to a point 1,000 feet offshore was laid 242 feet below the sea surface. The outfall line, which discharges up to 33.6 mgd of effluent with less than 8 ppm of oil, is designed to adhere to strict guidelines for underwater and surface construction established by environmental authorities. The polyethylene pipeline is 48 inches in diameter with walls 1.5

inches thick and is capable of withstanding an earthquake measuring up to 8.5 on the Richter Scale. The flexible, high density pipe is designed to endure low temperatures and large seismic waves. Butt-fusion joints, which are leakproof, connect the 60-foot lengths of pipe. (Lisk-FIRL)
W78-04413

PROCEEDINGS OF THE SIXTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES, APRIL 9-11, 1975.
For primary bibliographic entry see Field 5D.
W78-04417

UTILIZATION OF CHITOSAN FOR RECOVERY OF COAGULATED BY-PRODUCTS FROM FOOD PROCESSING WASTES AND TREATMENT SYSTEMS,
Georgia Univ., Experiment. Dept. of Food Science.
For primary bibliographic entry see Field 5D.
W78-04419

EVALUATION OF WASTE DISPOSAL PRACTICES OF ALASKA SEAFOOD PROCESSORS.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 626, Price codes: A15 in paper copy, A01 in microfiche. Report EPA/330/2-75/001, December 1974. 338 p, 61 fig, 56 tab, 6 ref, 5 append.

Descriptors: *Food processing industry, *Fish handling facilities, *Canneries, *Freezing, *Pollutant identification, Salmon, Crabs, Shrimp, Treatment facilities, Industrial wastes, Waste water treatment.

Waste disposal practices and treatment needs were evaluated at 26 facilities for freezing and canning salmon, crab, and shrimp in Alaska. Water quality was studied at 15 of the facilities in Bristol Bay, the Alaska Peninsula, and Southeast Alaska. Waste disposal methods were compared; effects of waste discharges on the aquatic environmrnt were studied; and solid waste distribution patterns were determined. The degree of treatment required to protect receiving waters was also examined. Scouring and tidal dispersion determined the level of treatment required. Dispersion prevented deposition of discharged solids when the outfalls were located in areas subject to fast-moving tides and lower than low water, and only wastes that have been ground were discharged. The discharge of unground wastes into tidal areas resulted in bottom deposition and water quality problems. This also occurred when ground or unground wastes were discharged to beaches or quiescent or shallow waters. Dissolved oxygen monitoring was considered unnecessary because of the area's large tidal volume and degree of mixing. (Snyder-FIRL)
W78-04439

MECHANICAL DEWATERING ALTERNATIVES FOR WASTE ACTIVATED SLUDGE--A PILOT STUDY,
National Council for Air and Stream Improvement, Kalamazoo, MI.
For primary bibliographic entry see Field 5D.
W78-04471

STATE-OF-THE-ART SURVEY AND EVALUATION OF OPEN-WATER DREDGED MATERIAL PLACEMENT METHODOLOGY,
JBF Scientific Corp., Wilmington, MA.
E. E. Johanson, S. P. Bowen, and G. Henry.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 024, Price codes: A09 in paper copy, A01 in microfiche. Contract Report D-76-3, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, April 1976. 196 p, 20 fig, 12 tab, 56 ref, 2 append. DACW39-74-C-0087.

Descriptors: *Dredging, *Sediments, *Reviews, Sediment control, Water, Oceans, Barges, Disposal, Borrow pits, Evaluation, *Dredged material, *Placement methodology, Open-water dredging, Hoppers, Dump size, Open-water disposal, Scows, Hopper dredges.

The dumping of dredged material into a borrow pit is feasible using hopper dredges provided that an auxiliary navigation capability such as an instrumented buoy at the center of the borrow pit or an electronic precision navigation system is available. Borrow pit dumping is undertaken less easily with barges and tug boats because of the inability to control accurately the position of the barges. Borrow pits have to be several acres in size and have dimensions sufficient to allow radial spreading of several hundred feet. No estimate of the long-term fate of dredged material placed in a borrow pit can be made. The concept of covering polluted dredged material was not considered efficient unless undertaken immediately after disposal. It was concluded that field and laboratory studies should be initiated to identify and to quantify the physical membranes associated with open-water disposal operations and that field and laboratory studies should be initiated to identify and to quantify the physical mechanisms associated with open-water disposal operations and that field demonstration and an evaluation of the horizontal pump-down concept should be developed. (Roberts-ISWS)
W78-04533

DREDGED MATERIAL RESEARCH PROGRAM, THIRD ANNUAL REPORT.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 300, Price codes: A05 in paper copy, A01 in microfiche. January 1976. 78 p, 34 fig.

Descriptors: *Environmental effects, *Dredging, *Environmental engineering, Environment, Research facilities, Water, On-site investigations, Wetlands, Marsh management, Research priorities, Projects, Disposal, Effects, Water quality, Habitats, Marsh development.

The objectives of the Dredged Material Research Program (DMRP) are to provide through research definitive information on the environmental impact of dredging and dredged material disposal operations and to develop technically satisfactory, environmentally compatible, and economically feasible dredging and disposal alternatives, including consideration of dredged material as a manageable resource. Specific goals of the DMRP are to determine the effects of open water, land, and wetland disposal on water quality and organisms; to test and to evaluate concepts of marsh development and land and water habitat development as environmentally beneficial disposal alternatives; to improve and to enhance the acceptance of confined land disposal as an alternative; to consider regulation of the dredging disposal operation as an environmental control measure; to develop and to test concepts for using disposal sites for productive purposes; and to consider the use of dredged material as a natural resource. Presented in the report was detailed information on the status of the DMRP up to January 1, 1976. Highlights of 1975 were accented, objectives of the field studies were emphasized and illustrated, and attention was given to results achieved or anticipated. (Roberts-ISWS)
W78-04534

NEW PORTOBELLO OUTFALL, BRIGHTON.
Water Services, Vol. 81, No. 982, p 764-766, December, 1977. 2 fig.

Descriptors: *Outfall sewers, *Pumping plants, *Discharge(Water), *Flow system, Tides, Oceans, Waste water treatment, *Waste water disposal, Treatment facilities, Sewers, Municipal wastes, Brighton(England).

A new outfall tunnel for the discharge of sewage effluents into the ocean has been constructed for the boroughs of Brighton and Hove in England. The outfall, whose construction began in 1971, was commissioned as a replacement for an outfall constructed in 1928 that had an average daily flow of 680 liters/sec. The new system has a daily flow capacity of 6800 liters/sec with an internal diameter of 2.13 meters. The outfall tunnel, which is 1830 meters long, is fitted with a diffuser system containing nine shafts, each with a four-part diffuser head. A new pumping station was completed in 1975 to treat the influent. Solids are removed from the influent by coarse raked bar screens and fine mesh cup screens. Grit is removed before the effluent passes to the automatically controlled pump sets. Screened solids are dewatered, checked for magnetic content, and processed by a twin-screw press where the moisture content is reduced to 50-55%. The pumping system is capable of discharging effluent during all tidal stages, with the outfall designed to act as a pressure main. The treatment and outflow plant was built near chalk cliffs which were below the water table. Construction problems were overcome by the installation of a system of sand/cement grout curtain walls and a base plug to solidify the fissured chalk and control the water inflow. (Lisk-FIRL)
W78-04561

THE BANGOR PROJECT.
Building Systems Design, Vol. 74, No. 6, p 10-14, October/November, 1977. 1 fig.

Descriptors: *Fertilizers, *Sludge digestion, *Treatment facilities, *Biodegradation, *Pilot plants, Soil amendments, Municipal wastes, Sludge treatment, Waste water treatment, *Bangor(Maine), Composting(Sludge).

Details of a sludge composting project being conducted in Bangor, Maine, by the Office of Solid Waste Management Programs of the United States EPA are presented. Objectives of the Bangor project were to evaluate the effects of bulking agents on sludge, to examine the use of suction aeration for control of odors and pathogens in sludge composting, to survey public opinion on sludge composting, and to identify potential uses for the final product. The approximately 50 cu yds of sludge generated each week in Bangor is hauled to the composting site and mixed with bark waste at a ratio of 3 parts bark to one part sludge. The four 200-cu yd, active aerated compost piles which receive the sludge/bark mixture are equipped with a piping network for suction aeration to provide the necessary oxygen for microbial degradation and stabilization of the sludge. The compost piles are monitored daily for temperature and oxygen content to insure that microorganism requirements are met. Heavy metals, primary nutrients, fecal coliform, Salmonella, and pH are measured quarterly in the sludge and compost. Application of the screened compost is currently limited to non-food chain crops. (Schulz-FIRL)
W78-04566

COMPOSTING RAW SLUDGE,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
E. Epstein, and G. B. Willson.
Building Systems Design, Vol. 74, No. 6, p 14-19, October/November, 1977. 3 fig, 2 tab, 8 ref.

Descriptors: *Composting(Sludge), *Sludge treatment, *Fertilizers, *Treatment facilities, *Pilot plants, Biodegradation, Sludge disposal, Municipal wastes, Waste water treatment, Aeration, Equipment, Soil amendments.

The Agricultural Research Service in Beltsville, Maryland, has developed a composting system for primary and secondary undigested sludge. Earlier unsatisfactory experiences with the windrow system of composting led to the development of the forced aeration system. The raw sludge is first

mixed with bark or woodchips to provide bulk. Air is vacuum drawn through the pile while a cover of finely screened compost from previous compost operations prevents odoriferous gases from escaping into the atmosphere. Air suction is applied for a period of 10-14 days and then the cycle is reversed to conduct air into the pile for a period of 7-10 days. The compost is removed from the pile after 21 days and then moved to a stockpile for a 4-week curing period. The woodchips are recovered for reuse when the cured compost is screened. The compost pile is monitored to maintain temperatures of more than 45C and oxygen levels of 5-15%. Equipment requirements for the forced aeration system are detailed. Pilot studies on composting of sludge obtained at the Blue Plains Waste Water Treatment Plant in Washington, District of Columbia, are described. (Schulz-FIRL)
W78-04567

PYROLYZING SEWAGE SLUDGE ALONE MOVES SLOWLY TOWARD MARKET.
Engineering News-Record, Vol. 199, No. 14, p 76, 80, 83, October, 1977.

Descriptors: *Pyrolysis, *Incineration, *Fuels, *Sludge disposal, *Sewage disposal, *Costs, Municipal wastes, Equipment, Waste water disposal, Sludge treatment, Activated carbon, Waste water treatment.

The pyrolysis of sewage sludge, alone or in combination with refuse-derived fuel, has been investigated because of greater energy recovery and less air pollution than from conventional systems. Nichols Engineering and Research Corporation of Belle Mead, New Jersey, has proposed a plan for the pyrolysis of some 7,500 tons per day of wet sludge from New York City and the adjacent northern New Jersey area. The operation should produce an energy equivalent of $22 million per year of fuel oil at current prices. The need for alternative means of sludge disposal other than offshore dumping and the prohibitive costs of land disposal led to the selection of on-site disposal. Pyrolysis was chosen over conventional incineration because it would produce less air pollution and could be carried out on a smaller, decentralized basis. Various test programs were conducted on sludges from several New York City plants. A small pyrolysis plant has been installed in Deep Water, New Jersey for the pyrolysis of 21 tons per day of wet sludge in a partial mode. The Deep Water facility was also designed to regenerate activated carbon for use in the treatment process. (Schulz-FIRL)
W78-04575

HEAVY METALS IN SEWAGE SLUDGE MAY MAKE IT UNSAFE FERTILIZER.
Farm Chemicals, Vol. 140, No. 11, p 98, November, 1977.

Descriptors: *Soil-water-plant relationships, *Cadmium, *Heavy metals, *Sludge disposal, Fertilizers, Soil chemical properties, Waste water disposal.

Sewage sludge may contain too much cadmium, zinc, and copper to allow safe, application of the sludge as fertilizer on farm lands. Although crop growth can be enhanced by nutrients in sewage sludge, the levels of heavy metals in the edible parts of corn, potatoes, soybeans, wheat, and sorghum crops should be monitored. During recent tests in which 20 tons of sewage sludge per acre were applied to the soil, a significant increase in cadmium and other heavy metals was observed in corn, potatoes, and wheat planted the following year. Levels of cadmium were increased by 22 times in corn, 27 times in wheat grain, and 4.3 times in potatoes. The average diet presently contains about 80% of the safe level of cadmium. Therefore it is suggested that cadmium levels not be increased in soil through the application of heavy metal-rich sludges. (Baker-FIRL)
W78-04579

DECOMPOSITION OF SEWAGE SLUDGE COMPOST IN SOIL: I. CARBON AND NITROGEN TRANSFORMATION,
Agricultural Research Service, Beltsville, MD.
C. F. Tester, L. J. Sikora, J. M. Taylor, and J. F. Parr.
Journal of Environmental Quality, Vol. 6, No. 4, p 459-463, October-December, 1977. 3 fig, 2 tab, 32 ref.

Descriptors: *Carbon, *Nitrogen, *Sludge disposal, *Soil chemical properties, *Mineralogy, Soil physical properties, Ammonia, Waste water disposal.

The rate and extent of decomposition of sewage sludge compost in soil was studied in laboratory-scale incubation experiments. Freeze-dried compost made from undigested sewage sludge was added to a loamy sand, a slit loam, a silty clay, and a sand at rates of 0, 2, 4, and 6% of the dry weight. The soil-compost mixtures were incubated at 22C in a constant CO2 atmosphere under NH3-free conditions. Mineralization and decomposition rates were measured according to CO2 and NH3 evolution and changes in the organic and inorganic fractions of C and N with time. The cumulative CO2 evaluation was linearly related to the sludge compost application rate. About 16% of the compost C evolved in 54 days of incubation. N mineralization was lowest in the silt-loam compost mixture. In the sand-compost mixture, mineral N was immobilized during incubation, Evolution of NH3 may have occurred in the silt loam and silty clay soils. The study demonstrated that the application of sewage compost to different soils can result in different degrees of mineralization, despite the linear relationship between decomposition and sludge application rate. (Baker-FIRL)
W78-04581

UTILIZATION OF WASTEWATER RESIDUES TO RECLAIM DREDGED EMBANKMENTS,
T. Lee Go, N. C. Vasuki, and P. S. Canzano.
Water and Sewage Works, Vol. 124, No. 11, p 83-84, November, 1977.

Descriptors: *Sludge disposal, *Land reclamation, *Canals, *Dredging, *Channel improvement, Spoil banks, Waste water disposal, Municipal wastes, Environmental effects, Sampling, Fertilizers, Soil-water-plant relationships, Heavy metals, Plant growth.

Problems associated with the disposal of municipal waste water sludge containing higher than normal heavy metal concentrations have resulted in a study by the City of Wilmington, Delaware, on the utilization of wastewater residues for the reclamation of dredged embankments. The federally owned land along the banks of the Chesapeake and Delaware Canal was selected as the sludge disposal test site. Advantages afforded by the site included: protection of the water table aquifer by the mound of dredged materials, little potential for harvesting of food crops, and the need for stabilization of the dredge spoils. Studies were conducted to compare dredge spoil reclamation with digested sludge and commercial fertilizer. Digested sludge from the Wilmington sewage treatment plant was applied to the 16-acre test site at a rate of 45 tons per acre. The area was then seeded with a K-31 tall fescue. Soil core samples taken before and after sludge application were analyzed for metal and anions. The pH of the soil water extract was also measured. Experiences with the sludge application were favorable, as the low pH of the dredge spoil was raised from 3 to 4. The growth and regrowth responses of grasses in the sludge-treated area were also improved. Sludge application reduced the leaching of heavy metals from the dredge spoils. (Schulz-FIRL)
W78-04585

LAND APPLICATION GUIDELINES FOR SLUDGES CONTAMINATED WITH TOXIC ELEMENTS,
Northern Virginia Community Coll., Woodbridge. Div. of Environmental and Natural Sciences.
G. A. Garrigan.
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 2380-2389, December, 1977. 5 tab, 25 ref.

Descriptors: *Sludge, *Toxins, *Federal Water Pollution Control Act, *Soil contamination, *Sludge disposal, *Nitrogen, Copper, Zinc, Nickel, Cadmium, Nutrients, Human pathology, Animal pathology, Vegetation effects.

Guidelines proposed for regulating the land application of municipal sludge containing toxic elements are reviewed. The first guideline limits sludge application on the basis of maximum concentrations of toxic elements in the sludge or the maximum ratio of ammonium nitrogen to toxic element concentrations. The major toxic elements discussed are zinc, copper, nickel, boron, and cadmium. The second guideline proposes maximum allowable concentrations of zinc, copper, and nickel in sludge destined for application to soils having no previous history of sludge application. This guideline would be modified to set limits for toxic elements in soil already having received sludge. The toxicity of cadmium to animals and humans is the concern of another guideline. An optimum nitrogen, or nutrient, loading rate to soil is suggested in the last guideline. (Lisk-FIRL)
W78-04588

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
J. Grainge.
Canadian Journal of Civil Engineering, Vol. 4, No. 4, p 436-444, December, 1977. 4 fig.

Descriptors: *Community development, *Environmental engineering, *Waste disposal, *Water conveyance, *Solid wastes, Recreation facilities, Long-term planning, Sewage lagoons, Permafrost, Ice fog, Canada, Arctic.

Environmental planning is necessary in northern Canadian communities to alleviate unsanitary living conditions and to protect the environment. Long range environmental engineering must conform with the severe climatic conditions in northern Canada. The climate and the isolated nature of the area also contribute to high construction costs and failure of conventional waste disposal and water supply methods. Settlement sites, road layout, recreational facilities and parks are considered important in planning. Consolidation of communities could provide the solution to problems such as ice fogs, high costs of long lengths of pipe needed for sewerage and water distribution systems, and road maintainance and building. Examples of well-planned communities in Finland, Greenland, and Iceland are cited as evidence that environmental problems can be overcome with advanced planning. Suggestions for insulated sewage and water pipes, waste disposal, and community planning are given. (Lisk-FIRL)
W78-04591

PRECIPITATED WASTE WATER PHOSPHORUS FERTILIZERS (ABWASSERPHOSPHATE ALS DUENGEMITTEL),
Institut fuer Agrikulturchemie, Goettingen (West Germany).
For primary bibliographic entry see Field 5D.
W78-04592

DISPOSAL OF SEWAGE SLUDGE ON LAND.
Water Services, Vol. 81, No. 979, p 539, September, 1977. 1 ref.

Descriptors: *Sludge disposal, *Sewage sludge, *Land use, *Standards, *Soil amendments, Optimization, Europe, Environmental effects, Hazards, Nutrients, Municipal wastes.

The beneficial effects of sewage sludge disposal by land application can outweigh hazards if recommended guidelines are observed. The interim guidelines for sludge application should optimize nutrient use and minimize any hazard to humans, animals, crops, the soil, or the environment. The guidelines published in a report by England's Department of the Environment and National Water Council provisionally recommended application rates for numerous elements, including nitrogen. The guidelines are not mandatory, but are interim targets pending publication of more scientific criteria. Comments on the guidelines are being solicited by the Department of the Environment in London, England. England's Standing Committee on the Disposal of Sewage Sludge was set up by the Department of the Environment and the National Water Council in 1975. The Committee is responsible for reviewing land disposal of sewage sludge and drafting a code of standard for sludge disposal. (Snyder-FIRL)
W78-04600

SERVO CONTROLLED OPTIMIZATION OF NITRIFICATION-DENITRIFICATION OF WASTE WATER IN SOIL,
Robert S. Kerr Environmental Research Lab., Ada, OK.
C. G. Enfield.
Journal of Environmental Quality, Vol. 6, No. 4, p 456-458, October-December, 1977. 5 fig, 1 tab, 9 ref.

Descriptors: *Infiltration, *Nitrification, *Denitrification, *Sewage treatment, *Municipal wastes, Chemical reactions, Sludge, Soil amendments, Treatment facilities, Electrical properties, Waste water disposal, Waste water treatment.

Studies were conducted to develop a servo control system which adjusts the rate of waste water application to land to ensure nitrification-denitrification. Operation of the control system is based on the potentials of five platinum electrodes used in conjunction with a Calomel reference electrode. A servo controller was used to regulate application of municipal trickling filter final effluent to four gravelly loam soil columns. The controller adjusted the frequency of waste water application with respect to the Pt electrode potential 6 cm under the soil surface. The duration of each application was regulated according to a target potential measured 30 cm beneath the surface, optimizing denitrification. Three soil columns received 7.5 metric tons (carbon) of digested municipal sludge/ha in the upper 30 cm of the profile. Waste water application was continuously allowed by the servo controller for the column that contained no sludge. Essentially all total Kjeldahl nitrogen-nitrogen was converted to nitrate-nitrogen in the upper 3 cm of this column. About 45% of the dissolved nitrogen disappeared in this column. Addition of sludge increased apparent denitrification, so that total nitrogen removal exceeded 90%. (Snyder-FIRL)
W78-04603

PUBLIC HEALTH ASPECTS OF LAND UTILIZATION OF WASTEWATER EFFLUENTS AND SLUDGES,
Johns Hopkins Univ., Baltimore, MD.
A. Wolman.
Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2211-2218, November, 1977. 2 tab, 17 ref.

Descriptors: *Sludge disposal, *Land use, *Effluents, *Public health, *Pollutant identification, Land management, Sludge, Soil amendments, Fertilizers, Sludge treatment, Sludge digestion, Municipal wastes, Waste water disposal, Waste water treatment.

The history and development of land-application of waste water and sludges are presented. In 1922, Baltimore authorities were permitted to use wet waste water sludge for fertilizer so long as certain conditions were met. The sludge had to be digested for a least 10 days, transported in water-tight vehicles, and applied before crops were planted. Soil accumulation of heavy metals contained in sludge had been considered to pose a hazard under certain circumstances. Although land disposal must be accompanied by cautious pesticide use, the latter cannot be considered as a primary constraint. Land disposal experiences over more than 100 years have indicated that application of waste water or its derivatives to land is practicable, provided it is carefully, efficiently, and continuously managed. A site with appropriate soil permeability and porosity must be available. Provisions must be made for storage in wet weather. Waste water should not be used to fertilize crops which are eaten raw. A monitoring program to protect groundwater quality should be instituted. Potential hygienic risks must be detected and controlled. Land application as a means of sewage disposal is limited in the United States by regional variations in geology, hydrology, meteorology, and topography. The process may not always be cost-effective. (Snyder-FIRL)
W78-04604

JURY ON LAND DISPOSAL OF WASTEWATER STILL OUT, MR. COSTLE,
For primary bibliographic entry see Field 5G.
W78-04606

SLUDGE IMPROVES SANDY SOIL, INCREASES YIELDS WITHOUT POLLUTING.
Crops and Soils Magazine, Vol. 30, No. 3, p 23-24, December, 1977.

Descriptors: *Sewage sludge, *Soil amendments, *Crop production, *Fertilizers, *Fertilization, Soil management, Soil-water-plant relationships, Pollutant identification, Municipal wastes, Soil properties, Soils, Waste water treatment.

The use of sewage sludge as a fertilizer can improve crop yields and increase the level of organic matter in sandy soil. Application at crop fertilization rates should not result in nitrogen pollution of groundwater. Anaerobically digested sludge decomposes and releases nitrogen in the soil at a slower rate than other varieties of sludge. Sludge from three waste water treatment plants was applied to sandy soil over a 4-year period at rates of 13, 26, and 52 tons/acre/yr. The highest application rate, representing a normal 15-20 year addition rate, was 210 tons/acre of total dry solids. Corn yields increased by an average of 60 bushels/acre at the high application rates. A control plot which received commercial fertilizer produced 120 bushels/acre. Nitrate levels in soil water below the corn root zone in plots treated with 13 tons of sludge/acre/yr were comparable to those in control plots fertilized with 250 lbs nitrogen/acre. Anaerobic sludge addition raised the organic matter level of the soil surface from 2.1 to 7.5%. Sewage sludge application should be limited to 5-10 tons/acre/yr to maintain high crop yields and low nitrate levels in soil percolates. (Snyder-FIRL)
W78-04608

A FIELD STUDY OF THE AGRICULTURAL USE OF SEWAGE SLUDGE: I. EFFECT ON CROP YIELD AND UPTAKE OF N AND P,
Ball State Univ., Muncie, IN. Dept. of Natural Resources.
K. A. Kelling, A. E. Peterson, L. M. Walsh, J. A. Ryan, and D. R. Keeney.
Journal of Environmental Quality, Vol. 6, No. 4, p 339-345, October-December, 1977. 6 tab, 29 ref.

Descriptors: *Sewage sludge, *Sludge disposal, *Fertilization, *Cultivated lands, *Crop production, Absorption, Nitrogen, Phosphorus, Municipal wastes, Waste water treatment.

The effects of sludge application at rates based on typical fertilizer N applications to high sludge disposal loading rates were examined with respect to crop yields, the residual fertility of the sludge, and the amounts of sludge-applied N and P recovered by the crops. Anaerobically digested liquid sludge was applied to field plots at rates of 0, 3.75, 7.5, 15, 30, and 60 metric tons of dry solids/ha on a sandy loam and a salt loam. Rye or sorghum-sudan was planted in the plots, followed by one to 3 seasons of corn. The first crop after sludge application showed significantly increased yields for application rates up to 7.5 metric ton/ha on silt loam soil and up to 15 metric tons/ha on sandy loam soil. Application of 30 and 60 metric tons/ha occasionally depressed yields of the first crop, possibly due to the presence of large quantities of soluble salts. There were residual benefits from the sludge for 3 years or more at the higher application rates. Generally, an increase in sludge application rate yielded higher concentrations of N and P in plant tissue. Total nutrient recovery averaged about 50% for available N and 7% for P and a low application rate, and about 14% for N and 3% for P at the highest rate of sludge addition. (Snyder-FIRL)
W78-04609

REVIVING THE SEPTIC TANK,
Bell Construction Co., Matteson, IL.
H. F. Bell.
Civil Engineering-ASCE, Vol. 47, No. 12, p 83-84, December, 1977.

Descriptors: *Waste water treatment, *Waste water disposal, *Sewage treatment, *Biological treatment, *Sewerage, Treatment facilities, Municipal wastes, Septic tanks, Sewage disposal, Size.

Approximately 25% of the United States population depends on individual sewage disposal systems. The septic tank for a single family house in Illinois is required to have a capacity of 500 gallons for each bedroom in the house. Percolation tests during a summer dry spell are used to determine the necessary trench area. Local requirements, which may call for distribution and drop boxes at strategic locations, influence field design. Septic failures in spring are typically caused by saturated soil and exceptionally high load; summer and fall failures usually involve line stoppage. A series of recommendations for improving septic sewage disposal are presented. Only organic wastes should be disposed of in a septic tank. The sludge level should be checked periodically; sludge and scum should be removed when the stored volume approaches total capacity. (Snyder-FIRL)
W78-04610

SLUDGE TREATMENT PROCESS OFFERS FLEXIBILITY, LOW COST,
Dorr-Oliver, Inc., Stamford, CT.
For primary bibliographic entry see Field 5D.
W78-04612

APPLICATION OF SEWAGE SLUDGE TO GARDEN PLOTS,
Vermont Univ., Burlington. Dept. of Microbiology and Biochemistry.
R. E. Sjogren.
Compost Science, Vol. 18, No. 5, p 26-32, September/October, 1977. 6 fig, 3 tab, 20 ref.

Descriptors: *Fertilizers, *Soil amendments, *Soil-water-plant relationships, *Plant growth, *Nutrient removal, *Sludge disposal, Soil contamination effects, Sewage bacteria, Vegetable crops, Environmental effects, Waste water disposal.

Studies with corn, tomato, and beet crops were used to assess the response of garden crops to two levels of high-temperature, anaerobically-digested

lime-amended sludge and one level of fertilizer. The effects of field addition of sewage sludge and fertilizer on plant yields and tissue elemental content were evaluated under local environmental conditions. Sludge application rates were based on the assumption that half of the nitrogen present in the sludge would be available to the plant. A double application of sludge was used to observe possible toxic effects metal ions. Results of elemental analyses of anaerobically digested sludge and sludge-grown plants are presented. Corn plant yields from plots receiving the inorganic fertilizer were essentially the same at all sludge application rates. For those plots which did not receive the inorganic fertilizer, yields were greatest with the double application of sludge. Gross yields of tomato plots were largest in terms of the number of fruit from the plot which received a double application of sludge and the inorganic fertilizer. The average weight per tomato was greatest from the plot which received the inorganic fertilizer but no sludge. Beet plant weight was much higher from those plots which received the inorganic fertilizer, irregardless on the amount of sludge applied. Iron and potassium deficiencies were exhibited by plants from some of the sludge-amended corn plots. Although tests for bacterial and viral pathogens in the amended sludge were negative, some transmission of soil bacteria by splashing onto corn stalks was observed. (Schulz-FIRL)
W78-04613

THE COMPARISON OF SLUDGE EXTRACTS AND CHU 10 IN CULTIVATING CHLORELLA PYRENOIDOSA,
Chinese Univ. of Hong Kong. Dept. of Biology.
M-H. Wong, and S-K. Ho.
Chemosphere, Vol. 6, No. 9, p 581-588, 1977. 3 fig, 1 tab, 14 ref.

Descriptors: *Ultimate disposal, *Nutrient removal, *Chlorophyta, *Chlorella, *Algae, Heavy metals, Chlorophyll, Proteins, Growth rates, Microorganisms, Feeds, Sludge disposal, Waste water treatment, Waste water disposal.

Increasing demands on the world's food supplies have led to various studies on the culturing of green algae as a source of protein. Experiments were conducted at the Chinese University in Hong Kong to evaluate the use of sewage sludge extracts as opposed to the Chu 10 medium for cultivating Chlorella pyrenoidosa green algae. Samples of sewage sludge were obtained from the University's treatment plant and extracts were prepared in concentrations of 1, 2, and 3%. Cell counts, chlorophyll, protein, and heavy metals were measured in Chlorella cultures. The growth rate in 1% sludge was higher than at other sludge concentrations and was also higher than in Chu 10. The cells cultivated in the 2% sludge extract had the highest chlorophyll content. The protein content in Chlorella cells fluctuated with time, regardless of the medium. Heavy metal concentrations were higher in the sludge-grown cells than in the Chu 10 variety. Since from 10 to 15% of the heavy metals in the sludge extracts were removed during culturing, the use of Chlorella pyrenoidosa is suggested as a possible means of waste water purification. (Schulz-FIRL)
W78-04616

METHODS FOR MEASURING THE DEGREE OF STABILITY OF AEROBIC STABILIZED SLUDGES,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W78-04620

OCCURRENCE OF ASPERGILLUS FUMIGATUS DURING COMPOSTING OF SEWAGE SLUDGE,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.; and Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
For primary bibliographic entry see Field 5C.
W78-04621

GROWTH OF LOBLOLLY PINE SEEDLINGS IN STRIP-MINED KAOLIN SPOIL AS INFLUENCED BY SEWAGE SLUDGE,
Southeastern Forest Experimental Station, Athens, GA. Inst. for Mycorrhizal Research and Development.
C. R. Berry, and D. H. Marx.
Journal of Environmental Quality, Vol. 6, No. 4, p 379-381, October-December, 1977. 2 tab, 11 ref.

Descriptors: *Sewage sludge, *Soil amendments, *Loblolly pine trees, *Spoil banks, *Plant growth, Growth rates, Reclamation, Municipal wastes, Organic wastes, Root development, Organic matter, Waste water treatment.

A study was carried out to determine whether adding sewage sludge to kaolin spoils would improve growth of loblolly pine seedlings. The minimum quantity of sludge addition needed to significantly increase growth and the maximum quantity that could be used without reducing growth were also determined. Loblolly pine seedlings were transplanted and grown for 6 mos in strip-mined kaolin spoil amended with different amounts of dry sludge. Seedlings on spoil amended with the equivalent of 34 metric tons of sludge/ha were 49% taller, 79% greater in stem diameter, and had a 126% greater fresh weight than seedlings grown without sludge. The percentage of short-roots having ectomycorrhizae was higher for seedlings grown with 34 and 69 metric tons of sludge/ha than for those grown in spoil which received 0, 138, or 275 metric tons/ha. Chemical analyses showed significantly greater amounts of residual organic matter and elements essential for plant growth in sludge-amended kaolin spoil than in non-amended spoil. Sewage sludge apparently is a very good organic amendment; even small amounts stimulate growth and mycorrhizal development of loblolly pine seedlings. (Snyder-FIRL)
W78-04624

RECYCLING SEWAGE THROUGH PLANT COMMUNITIES,
Marine Biological Lab., Woods Hole, MA.
G. M. Woodwell.
American Scientist, Vol. 65, No. 5, p 556-562, September-October, 1977. 6 fig, 13 ref.

Descriptors: *Soil-water-plant relationships, *Nutrient removal, *Water reuse, *Waste water disposal, *Path of pollutants, Hydrologic cycle, Municipal wastes, Industrial wastes, Plant growth, Sewage treatment, Waste water treatment.

Water is continuously taken up by municipal and industrial users and then discharged back to the natural environment where it undergoes purification. Although many sewage treatment plants have been constructed as means of pollution abatement, the toxins entering the environment still pose hazards to aquatic life and to subsequent users of the discharged waste water. The importance of natural vegetation has been considered with respect to the role that normal patterns of water and nutrient flows in nature play in the further purification of discharged sewage effluents. Various studies on the terrestrial absorption of sewage-borne nutrients are reviewed. The use of aquatic systems to purify waste water is discussed with respect to pilot studies involving meadows and a combination of marshes and ponds. (Schulz-FIRL)
W78-04639

TRANSPORT OF HEAVY METALS IN A SLUDGE-TREATED FORESTED AREA,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-04653

KANSAS TREATMENT PLANT USES SUBSURFACE INJECTION OF SLUDGE,
Black and Ventch, Consulting Engineers, Kansas City, MO.
For primary bibliographic entry see Field 5D.
W78-04655

WATER SUPPLY AND WASTE DISPOSAL SYSTEMS FOR ARCTIC COMMUNITIES,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W78-04669

5F. Water Treatment and Quality Alteration

WATER SUPPLY DISINFECTION WITH IODINE AND SILVER,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol. 32, No. 2, p 24-25, February, 1978.

Descriptors: *Disinfection, *Silver, *Iodine, Water purification, Chlorination, Water supply, *Water treatment.

Extensive use of chlorine as a disinfectant in U. S. water systems has stifled the growth of alternative methods of disinfection, including iodination and silver treatment systems. Iodine disinfection has been successfully practiced by various U. S. government agencies in specialized situations. Advantages of iodination include its applicability over a wider pH range than for chlorine, simplicity of treatment hardware, and the fact that iodine does not react with ammonia and nitrogenous substances. Unfortunately, iodine treatment is 20 times more expensive per unit of germicidal effectiveness than chlorine. Iodine can also impart taste and color to water, as well as contribute to thyroid dysfunction in endemic area of goiter. Although the cost of silver per pound is high, the minute amounts required for disinfection make it an economically viable alternative. Silver treatment units are compact and simple, and the treatment itself leaves no taste or odor. Because of problems associated with its use, especially from interference with other chemicals in water and necessity of long contact time, silver disinfection is not recommended for individual water systems. (Eberle-NWWA)
W78-04293

REVERSE OSMOSIS IS EFFECTIVE METHOD FOR DESALTING WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 3A.
W78-04297

HEALTH IMPLICATIONS OF WATER CONTAMINANTS IN MAN,
National Cancer Inst., Bethesda, MD.
For primary bibliographic entry see Field 5C.
W78-04302

GLOBAL DISTRIBUTION OF CARCINOGENIC POLLUTANTS IN WATER,
National Cancer Inst., Bethesda, MD.
For primary bibliographic entry see Field 5B.
W78-04304

THE INTERNATIONAL COOPERATION IN STUDYING THE HEALTH ASPECTS OF ORGANIC CONTAMINANTS IN INDIRECTLY REUSED WASTE WATER,
International Reference Center for Community Water Supply, Leidschendam (Netherlands).
For primary bibliographic entry see Field 5D.

W78-04305

METHOD AND APPARATUS FOR PURIFYING EMULSIONS AND CONTAMINATED WATER WITH ELECTROLYSIS,
For primary bibliographic entry see Field 5D.
W78-04307

WATER PURIFICATION APPARATUS AND METHOD,
For primary bibliographic entry see Field 5D.
W78-04318

ELECTROLYTIC CELL FOR TREATMENT OF WATER,
J. Miller.
U.S. Patent No. 4,048,030, 11 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 962, No 3, p 737, September 13, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Electrolysis, Cathodes, Anodes, Water softening, Equipment.

An electrolytic cell is described for the treatment of water, comprising a closed container with a lower inlet opening and an upper outlet opening for the water and a cathode and an anode. In the interior of the electrolytic cell particles are located whose density is higher than that of the water and which are prevented from leaving the electrolytic cell by gratings adjacent to the inlet and the outlet. The electrolytic cell can be used for the treatment of water, and more particularly for the purification and disinfection of small and large swimming pools, for preparing drinking water for towns and small consumers and also for softening water down to any desired degree of hardness. (Sinha-OEIS)
W78-04331

LAND DISPOSAL OF CHEMICAL SLUDGE,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W78-04371

ACCUMULATION OF SLIME IN DRAINAGE PIPES AND THEIR EFFECT ON FLOW RESISTANCE,
Clay Pipe Development Association Ltd., London (England).
For primary bibliographic entry see Field 8B.
W78-04506

STATE OF THE ART IN WATER TREATMENT DESIGN, INSTRUMENTATION, AND ANALYSIS,
Kennedy Engineers Inc., San Francisco, CA.
R. A. Ryder.
Journal of the American Water Works Association, Vol. 69, No. 11, p 612-620, November, 1977. 14 tab, 17 ref.

Descriptors: *Municipal wastes, *Treatment facilities, *Filtration, *Flocculation, *Disinfection, Instrumentation, Analysis, Design, Waste water treatment, Waste water disposal.

Sampling and analysis is recommended for the identification of water quality variations which may influence treatment choice. Water treatment methods include chemical addition, flocculation, sedimentation, filtration, taste and odor removal, corrosion and scale control, and disinfection. Waste water recovery has been practiced for many years in California. Waste water recovery ponds usually contain two basins. Pumps convey the waste water back into the treatment plant's rapid-mixing chamber. Alum-coagulant and iron-coagulant sludges are often very compressible, but only thicken naturally to about 10% solids. Precoats or chemical additives are often required to filter or centrifuge the sludge efficiently. Polyelectrolyte coagulants produce much smaller quantities of sludge, reducing sludge handling five to 10 times compared with alum sludge requirements. Sludge-disposal methods include: air drying followed by burial, spraying on land, and mechanical dewatering. Mechanical dewatering is often the only method available for concentrating sludge if the treatment plant site is restricted or too wet for air drying. Despite the availability of improved centrifuges and automated press-leaf filters, mechanical dewatering is still costly. Water treatment plants frequently monitor turbidity with a pilot filter to protect against coagulant chemical inadequacy. (Snyder-FIRL)
W78-04578

ALGAL CANCER AND ITS CAUSES: I. CARCINOGENIC POTENCIES OF WATER AND SUSPENDED SOLIDS DISCHARGED TO THE RIVER OHMUTA, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5C.
W78-04596

WATER RECLAMATION--QUALITY TARGETS AND ECONOMIC CONSIDERATIONS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W78-04597

EFFECTS OF PH AND MIXING ON POLYMER CONDITIONING OF CHEMICAL SLUDGE,
Du Pont de Nemours and Co., Inc., Wilmington, DE.
J. J. O'Brien, and J. T. Novak.
Journal of the American Water Works Association, Vol. 69, No. 11, p 600-605, November, 1977. 13 fig, 2 tab, 13 ref.

Descriptors: *Municipal wastes, *Industrial wastes, *Hydrogen ion concentration, *Mixing, *Polymers, Sludge treatment, Sludge, Chemical wastes, Resistance, Dewatering.

Laboratory studies were conducted to evaluate polymer performance with respect to various sludge characteristics, including chemical composition, pH, specific resistance, and cake solids. Polymers were mixed with sludge samples in 300 ml beakers, and the amount of polymer needed to achieve a maximum decrease in specific resistance was determined. Organic polymers can be used to improve dewatering rates of inorganic sludges. The trail-and-error method usually used to select polymers can be greatly simplified when the polymer characteristics are provided. Cationic polymers are most efficient at pH of 7 or less. Nonionic polymers and the lower percent hydrolysis anionic polymers function effectively at pH 6.5-8.5. The effectiveness generally decreased as the pH increased. The 50% hydrolysis anionic polymer was most effective above pH 8.5. Too much or too little mixing can greatly reduce polymer effectiveness. The required degree of mixing depends on the solids concentration in the sludge. (Snyder-FIRL)
W78-04611

DISINFECTION OF DRINKING WATER, SWIMMING-POOL WATER AND TREATED SEWAGE EFFLUENTS,
Health Effects Research Lab., Cincinnati, OH.
N. A. Clarke, and W. F. Hill, Jr.
In: Disinfection, Sterilization, and Preservation, Block, S. S. (ed.), Lea and Febiger, Philadelphia, Pennsylvania, 1977. p 705-722, 2 fig, 100 ref.

Descriptors: *Waste water treatment, *Waste water disposal, *Municipal wastes, *Water treatment, *Disinfection, *Swimming pools, Sewage treatment, Biological treatment, Activated sludge, Pollutant identification, Analytical techniques.

In disinfecting water and treated effluents, infections microorganisms must be destroyed to prevent transmission of pathogens. Because it is difficult to measure some residual concentrations of disinfectants, coliform levels are often used. Whether this accurately measures biological safety has been questioned in view of the resistance of viruses to disinfection. Dosage, contact time, temperature, other organic and inorganic material in the water, and pH can affect disinfection efficiency. Chlorine, chlorine dioxide, bromine, iodine, ozone, silver, ultraviolet radiation, ionizing radiations, and heat have been used to disinfect drinking water. Chlorine and its compounds, iodine, bromine, and silver are used as swimming pool disinfectants. Copper sulfate is used to control algae in pool water. Chlorine and its derivatives are the most widely used disinfectants in sewage treatment. Flash mixing at pH 5.0 can provide disinfection equivalent to four times the normal chlorine dosage. The final product water from advanced waste treatment must be disinfected to prevent transmission of microbial pathogens. The activated sludge process, properly carried out, will eliminate most sugars and amino acids, which can interfere with disinfection. After filtration and adsorption in a carbon column, disinfection with chlorine is easily accomplished. Water must be chlorinated before reverse osmosis to prevent membrane plugging by microbiological growth; the chlorine also disinfects the effluent. (Snyder-FIRL)
W78-04614

BALANCE IN TRAINING FOR LATIN AMERICAN WATER AND WASTEWATER UTILITIES,
Pan American Health Organization, Lima (Peru).
N. F. Carefoot.
Journal of the American Water Works Association, Vol. 69, No. 12, p 641-643, December, 1977. 2 tab.

Descriptors: *Training, *South America, *Water works, *Sewerage, *Personnel, Manpower, Municipal wastes, Water treatment, Cities, Waste water treatment.

Training programs for supporting subprofessional, technical, and trade personnel in water and waste water treatment have fallen behind needs for trained personnel in Latin America. A manpower and training resources inventory was recently completed in Peru. An estimated 80% of current workers require training for their present jobs. An estimated 6,000 additional employees will be required by water and waste water utilities within 5 yrs. A 30% increase in the portion of city dwellers served by sewers has been adopted as a minimum goal by 28 countries in the western hemisphere. Various aspects recommended for a balanced training program include: a preparatory working group, inventories of human and training resources, review of personnel policies, establishment of training policies, preparation of training material and methodology, cooperation between training institutions, and an accountability system. (Snyder-FIRL)
W78-04641

METHOD DEVELOPMENT AND MONITORING OF POLYNUCLEAR AROMATIC HYDROCARBONS IN SELECTED U.S. WATERS,
Syracuse Research Corp., NY.
For primary bibliographic entry see Field 5A.
W78-04656

RELATIONSHIPS AMONG POLLUTION INDICATOR BACTERIA ISOLATED FROM RAW WATER AND DISTRIBUTION SYSTEMS BY THE PRESENCE-ABSENCE (P-A) TEST,
Ontario Ministry of the Environment, Rexdale.
For primary bibliographic entry see Field 5A.

W78-04664

WATER SUPPLY AND WASTE DISPOSAL SYSTEMS FOR ARCTIC COMMUNITIES,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
G. W. Heinke, and B. Deans.
Arctic. 26(2), p 149-159, 1973.

Descriptors: *Arctic communities, Bays, *Canada, *Frobisher Bay(NWT), *Waste disposal, *Water supply.

The special problems of providing adequate water supply and waste disposal systems for arctic settlements are examined at the community of Frobisher Bay, Northwest Territories. The 2 existing methods, a trucked and a piped system, are compared for adequacy, reliability and cost. A series of alternative improvements to upgrade community services is proposed. Any of the suggested alternatives up to the level of complete piped services are feasible for engineering and economic points of view.--Copyright 1974, Biological Abstracts, Inc.
W78-04669

5G. Water Quality Control

PHYSICAL AND CONCEPTUAL SIMULATION OF EFFLUENTS FROM DREDGED MATERIAL CONFINEMENT FACILITIES,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
J. A. FitzPatrick,, D. Atmatzidis, and R. J. Krizek.
Water Resources Bulletin, Vol. 13, No. 6, p 1107-1118, December 1977. 5 fig, 2 tab, 15 ref. Army DACW39-74-R-0007.

Descriptors: *Dredging, *Spoil banks, *Sedimentation, *Model studies, Laboratory tests, Mathematical models, Effluents, Suspended solids, Clays, Freshwater, Saline water, Filtration, *Separation techniques, Water quality control, Wastes, Sedimentology, *Confinement facilities.

Environmental protection dictates that effluents of desired quality should be discharged from dredged material confinement facilities. In general, this can be accomplished by supplementing the solid-liquid separation obtained by simple sedimentation with appropriate filter systems which provide additional clarification. A methodology to estimate the sedimentation required in a disposal area was developed on the basis of classical sedimentation theories and compared favorably with field data. A procedure then was advanced and documented whereby effluents from dredged material confinement facilities can be modeled successfully for laboratory filtration tests. For these purposes, inorganic suspended solids can be simulated reasonably well by adjusting the concentration of commerically available clays, and fresh or saline water environments can be simulated satisfactorily by tap water or sodium chloride solutions, respectively. (Sims-ISWS)
W78-04203

OIL SLICK RETAINING BOOM FOR OFF-SHORE OIL WELLS,
B. J. Sessions.
U.S. Patent No. 4,043,131, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1496, August 23, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution sources, *Water quality control, Floats, Bodies of water, Equipment, Containment, Oil retaining boom.

An oil-retaining boom adapted particularly for use surrounding off-shore oil wells and drilling rigs to retain oil spillages and surface oil slicks within the boom has floats moveably interconnected in side-by-side relationship by connecting cables. The boom is adapted to float at or near the surface of the water and has a continuous sheet member attached to the floats so that the flat surface of the sheet is held perpendicular to the surface of the water, thereby enabling the sheet to retain oil on one side. The individual floats are buoyant and have an elongate structure, preferably hexagonal, with weights at one elongate end adapted to hold that end downward in the water to provide stability and an upright relationship of the float with the water surface. (Sinha-OEIS)
W78-04308

CRYOGENIC BEACH CLEANER,
R. F. Wendt, J. R. Acker, and N. R. Braton.
U.S. Patent No. 4,043,140, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1499, August 23, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution control, Beaches, Oil spills, Cryogenics, Sands, Spraying, Equipment, Waste disposal, Liquid nitrogen.

The object of this invention is to provide an efficient and ecologically unharmful method and associated equipment for restoring sandy beaches which have been contaminated by an oil spill. The method includes spraying liquid nitrogen onto the contaminated area so as to solidify the oil and sand into a mixture which can be easily separated from the clean underlying sand. A cryogenic beach-cleaning apparatus or vehicle is provided which includes a spray-head positioned forward of the vehicle for spraying the contaminated area and shovel means for separating the solidified mixture from the underlying sand. Conveyors transport the separated mixture and deliver it to trailers or trucks which are used to transport the mixture to a treatment or disposal site. (Sinha-OEIS)
W78-04310

FLOATING BAG FOR POLLUTION STUDY,
Case Existological Labs., Ltd., Victoria (British Columbia). (Assignee).
For primary bibliographic entry see Field 5A.
W78-04323

METHOD FOR COLLECTING LIGHT-WEIGHT SUBSTANCE FLOATING ON A LIQUID SURFACE,
Ballast-Nedam Groep, N.V., Amstelveen (Netherlands). (Assignee).
E. Irons.
U.S. Patent No. 4,046,691, 5 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 296, September 6, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water pollution control, Oil pollution, Oil-water interface, Nozzles, Jets, Equipment, Containment, Collecting reservoirs.

Oil floating on the surface of a body of water is collected by providing an enclosure with an open bottom and side walls extending from a depth below the interface between the oil and water to above surface of the body of water. A nozzle is located above the surface of the body of water outside of a spaced from the side walls of the enclosure. It is directed downward to a location beneath the open bottom of the enclosure. A stream of water from the nozzle is directed through the oil on the surface of the body of water so that the oil is displaced to a location beneath the open bottom of the enclosure. It is then allowed to rise to the surface of the water within the enclosure. The oil is then removed from the enclosure. (Sinha-OEIS)
W78-04327

ELECTROLYTIC CELL FOR TREATMENT OF WATER,
For primary bibliographic entry see Field 5F.
W78-04331

FLOW PATTERN CONTROL BY ENTRAINMENT REGULATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
W. H. C. Maxwell, and M. Demissie.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY10, Proceedings Paper 13271, p 1121-1134, October 1977. 12 fig, 10 ref, 2 append. OWRT B-083-ILL(2), 14-31-0001-4079.

Descriptors: *Control structures, *Outlet works, *Fluid mechanics, *Laboratory tests, Hydraulic models, Model studies, Diffusion, Mixing, Entrainment, Outlets, Powerplants, Waste water(Pollution), Water pollution, Industrial wastes, Waste dilution, Hydraulics, Slot outlets.

A technique for controlling the flow to a vortex zone trapped between the top of a shallow submerged slot outlet, the free surface, and two lateral wing-walls was examined experimentally to show that it may be used to control the flow pattern near the slot outlet. The range of wing-wall crest elevations for which flow patterns may be controlled was shown to be a function of wing-wall length. The stability of the flow pattern also was examined experimentally and was found to depend, for a particular wing-wall spacing, on the submergence of the slot outlet and on a Froude number based on average outlet velocity and wall spacing. The flow pattern control technique may have value in back-fitting some existing outfalls on thermal power plant outlets where strict temperature control is required. (Sims-ISWS)
W78-04336

RELIABILITY OF NITRIFICATION SYSTEMS WITH INTEGRATED PHOSPHORUS PRECIPITATION,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W78-04346

SURFACE WATER QUALITY IN CANADA - AN OVERVIEW.
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
1977. 45 p, 15 fig, 2 tab, 17 ref, 2 append.

Descriptors: *Surface waters, *Quality control, *Canada, *Water quality control, *Chemical analysis, Phenolic pesticides, Phosphorus, Nitrilotriacetic acid, Pesticides, Polychlorinated biphenyl, Trace elements, Metals, Rivers, Fraser River, Mackenzie River, South Saskatchewan River, Red River, St. Lawrence River, Saint John River, Upper Humber River, Ottawa River, Grand River.

This report presents an overview of the quality of surface waters in Canada and makes comparisons with water quality prior to 1960 as described by Thomas. As such, it does not consider in depth, local quality concerns, but instead, offers a national perspective. Surface water quality in Canada is generally good when viewed in the light of water quality guidelines and criteria. The report underlines the dramatic regional differences which exist with respect to certain quality characteristics, for example, hardness; but it stresses that such differences are, for the most part, natural in origin. Specific high-profile parameters such as phosphorus, nitrilotriacetic acid (NTA), phenols, pesticides, polychlorinated biphenyls (PCBs), trace elements, and metals, are highlighted. The dynamic nature of water quality is also discussed. Trend analyses were conducted at selected locations on major rivers in Canada, and gradually changing conditions are indicated at a few locations. (WATDOC)
W78-04349

STORAGE FOR STORM WATER QUALITY CONTROL - MEADOWVALE TEST SITE STUDY,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
M. P. H. Murrey, and J. J. Ganczarczk.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 63, 1977. 65 p, 18 fig, 41 ref, 17 tab, append. 75-8-36.

Descriptors: *Storm water, *Quality control, *Storage, *Settling basins, *On-site tests, *Runoff, Watersheds(Basins), Flow measurement, Hydrologic data, Model studies, Urban runoff, Water pollution, *Canada, *Meadowvale Test Site Study(Ont), Mississauga(Ont).

Two computer models, the U.S. Environmental Protection Agency's SWMM and the U.S. Army Corps of Engineers' STORM were applied for simulation of urban runoff phenomena in a test catchment of the 'new town' of Meadowvale prior to development and after its completion. A special subroutine for the STORM model was developed to simulate the performance of an in-stream settling basin-reservoir system for storm water quality control. It was predicted that the uncontrolled urbanization of the Meadowvale catchment would lead to a deterioration of storm water quality. Expected increases in annual pollutant yields (compared with undeveloped conditions) would be: BOD from 4 to 26 lb per acre; SS from 34 to 171 lb per acre; nitrogen from 1 to 10 lb per acre, and, orthophosphate from 0.4 to 1 lb per acre. Hydrologically, peak flows might increase by a factor ranging from two to five depending on the storm frequency, while the total annual runoff would increase from 4.1 inches per annum to 8 inches per annum. The settling basin-reservoir system to be constructed at Meadowvale should significantly improve runoff characteristics. Predicted yields of pollutants passing through the system to the Credit River were: BOD - 1.1 lb per acre; SS - 11lb per acre; nitrogen - 7 lb per acre; and orthophosphate - 0.8 lb per acre. Peak flow rates would drop, the actual reduction in the flow rate depending on the size and temporal pattern of the storm. It was estimated that the system designed for Meadowvale would reduce peak flows to pre-urbanized levels or less for storms which return periods less than one year. The studied system of storm water quality control appears to be very attractive. (WATDOC)
W78-04357

WASTEWATER USER CHARGES AND INDUSTRIAL COST RECOVERY: GUIDELINES AND EXAMPLES,
Department of Fisheries and Environment, Ottawa (Ontario).
P. M. Ashton, and W. R. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 703, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 112, February 1978. 67 p, 20 tab, 2 append.

Descriptors: Treatment facilities, *Waste treatment charges, Waste water treatment, *Municipal wastewater charges, Pollution taxes(Charges), *User charges, Utility rates(Waste treatment), *Industrial cost recovery, Industrial charges, Industrial assessment.

Municipal applications for federal grants to construct wastewater treatment works require approval by the Environmental Protection Agency. Adoption of a system of user charges and industrial cost recovery procedures are two of the prime requisites in successful application. These systems must be designed to ensure that all users of federally financed treatment works share in both the capital and the operation and maintenance costs of the facility in a manner proportionate to the extent of their use. This study offers guidelines which, if followed, will enhance favorable review of a grant application by the EPA. It also presents industrial cost recovery procedures and user charge systems that were developed with the goals of providing equity of charge assessment among users and user classes, conformity with prevailing EPA rules and regulations, and simplicity from the viewpoint of those local officials administratively responsible for systems implementation.
W78-04364

EXCESS FISHPOND NUTRIENT REMOVAL AND UTILIZATION BY WATERCHESTNUT CULTURE,
Clemson Univ., SC. Dept. of Entomology and Economic Zoology.
H. A. Loyacano, Jr., and C. L. McCord, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 711, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute, Clemson University, Report No. 69, June 1977. 61 p, 5 fig, 27 tab, 18 ref, append. OWRT A-028-SC(1), 14-34-0001-6042.

Descriptors: *Chinese waterchestnuts, *Channel catfish, *Production, Water quality, *Phytoplankton, *Nutrient removal, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Ponds, Water pollution control.

The effects of Chinese waterchestnut (Eleocharis dulcis) on production of channel catfish (Ictalurus punctatus) and resulting water quality were studied in 1974 and 1975 in .04-hectare earthen ponds at Clemson University. Ponds containing Chinese waterchestnut in 1975 had significantly lower levels of nitrate nitrogen and ammonia nitrogen and these lower nutrient levels appeared to have resulted in lower phytoplankton levels in these ponds. Data from both years indicated that this plant had no effect on channel catfish production. Large fluctuations in water level in 1974 and poor fish survival in 1975 may have prevented detection of any effect of Chinese waterchestnut on channel catfish production. Chinese waterchestnut plants removed nutrients from the pond water. Mean nutrient removal per hectare for the 201 day growing season in 1975 was 108.06 kilograms of nitrogen, 6.90 kilograms of phosphorus, 254.03 kilograms of potassium, 66.40 kilograms of calcium, and 37.46 kilograms of magnesium. These data indicate that Chinese waterchestnut should remove nutrients in sufficient quantities to improve water quality and allow increases in feeding rates and greater catfish production.
W78-04367

A SALINITY MANAGEMENT STRATEGY FOR STREAM-AQUIFER SYSTEMS,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg, and J. W. Labadie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 980, Price codes: A03 in paper copy, A01 in microfiche. Hydrology Papers, Colorado State University, No. 84, February 1976, 41 p, 38 fig, 11 tab, 25 ref. OWRT C-6301(5229)(3).

Descriptors: Salts, *Salinity, Irrigation, *Irrigation effects, Groundwater, Model studies, Simulation analysis, Optimization, Economics, *Surface-groundwater relationships, *Water management(Applied).

One of the pressing problems facing irrigation intensive areas is the increasing salinity of groundwater. Currently proposed solutions, such as agricultural sewering and desalinization, require large capital investment. There appear to be few available alternatives which are both low cost and effective in controlling aquifer degradation from irrigation drainage. The ultimate result in many areas may be abandonment of the groundwater resource and increasing dependence on more expensive imported water. Presented is a cost-effective salinity management technique which may be feasible for many stream-aquifer systems. The basic idea is to encourage application of pumped water downstream of the well from which it is pumped, rather than within its vicinity. In this way, a mechanism is established for accelerating the downstream transport of salts in the groundwater at a more rapid rate than would occur naturally through convection and dispersion, while still satisfying irrigation demands. The strategy is referred to as the Accelerated Salt TRANsport (ASTRAN) Method. Salt accumulation can be controlled in this manner, while taking care that salt problems are not simply transferred downstream. (See also W78-00442) (Skogerboe-Colorado State)
W78-04374

PUTTING ACTIVATED CARBON IN PERSPECTIVE TO 1983 GUIDELINES,
Engineering Science, Inc., Austin, TX.
D. L. Ford.
Industrial Water Engineering, Vol. 14, No. 3, p 20-27, May/June, 1977. 9 fig, 3 tab, 15 ref.

Descriptors: *Activated carbon, *Adsorption, *Separation techniques, *Industrial wastes, *Chemical wastes, Effluents, Operation and maintenance, Waste water treatment.

The feasibility of the activated carbon process for industrial wastewater treatment depends on the amenability of the dissolved waste water constituents to sorption, the presence of other substances which enhance or impede the sorption process, and operation and maintenance requirements of the system. This article presents a brief chronological history of the development of EPA guidelines for activated carbon. Some of the basic technological concepts and experiences in treating industrial waste water with activated carbon adsorption is given. Adsorption theory and the use of batch isotherm studies are discussed. As effluent quality requirements become more stringent under the 1983 Best Available Technology guidelines, activated carbon adsorption will come into more widespread use, primarily through the selective treatment of individual process streams or as an effluent polishing process. It is imperative, however, that its qualitative limitations be understood when considering its application. (Baker-FIRL)
W78-04378

A WASTE STREAM MANAGEMENT SYSTEM,
Dow Chemical Co., Pittsburgh, Pa.
P. Grover.
Chemical Engineering Progress, Vol 73, No 12, p 71-73, December, 1977. 3 fig.

Descriptors: *Water reuse, *Evaporators, *Industrial wastes, *Chemical wastes, Industrial water, Recycling, Waste water treatment, Waste water disposal, Equipment, Separation techniques, Solar radiation.

A waste stream management program adopted by the Dow Chemical plant in Pittsburg, California, is described. The first phase of the program identified sources, uses, and sinks of water in the plant. The next phase of the program attempted to define a balance between the three categories which would achieve the zero discharge goal for aqueous effluents. The water management plant in operation at the plant since 1975 utilizes three main water sub-systems, including a cooling water loop, a recycle water loop, and an aqueous chemical sewer. A series of solar evaporation ponds provide the primary means of waste water disposal at the plant. Waste chemicals passed to the ponds must be water-soluble, nonodorous, and not inhibit evaporation from the pond surface in any manner. Although the system is not considered technically feasible for areas of the country having lower annual evaporation rates, the waste manage-

ment system is recommended as a means of minimizing overall discharge volumes. (Baker-FIRL)
W78-04383

DIAMONDS ARE FOREVER, SAYS THE MAN WHO GIVES THEM NEW LIFE.
Materials Reclamation, Vol. 130, No. 17, p 28-29, October, 1977.

Descriptors: *Industrial wastes, *Calcium, *Copper, *Phosphorus compounds, *Suspended solids, Metals, Weirs, Chemical precipitation, Waste water treatment, Treatment facilities.

The control of polluting effluents from the diamond reclamation industry is discussed. Diamond Reclamation Services Ltd of Crawley, England, refurbishes industrial diamonds from wheels, saws, and other tools used by motor industries, engineering companies, and masonry operations. The industrial diamonds undergo reshaping, recrushing, and grading according to diamond dust quality. Waste materials produced in the reclamation process include calcium, copper, tungsten carbide, and phospor bronze, as well as foreign material such as tea leaves and cigarettes discarded in extraction units. Regulations established by England's Thames Water Authority limit the concentration of suspended metal solids, the major waste from diamond reclamation, in waste water to 10 ppm. Due to increased effluent removal charges by contractors, the Diamond Reclamation company built a waste treatment plant that meets control standards. The process involves the precipitation of suspended solids in effluent with a weir system and the neutralization of acids. The automatic treatment system installed by Diamond Reclamation Services Ltd is valued at 30,000 British pounds Sterling. (Lisk-FIRL)
W78-04386

CONTROLLING THE ENTRANCE OF TOXIC POLLUTANTS INTO U.S. WATERS,
Department of Commerce, Washington, DC. Office of Environmental Affairs.
B. R. Barrett.
Environmental Science and Technology, Vol. 12, No. 2, p 154-162, 1978. 1 fig.

Descriptors: *Federal Water Pollution Control Act, *Potable water, *Transportation, *Pesticides, *Navigable waters, Radioactive wastes, Sea water, Toxins, Insecticides, Fungicides, Rodenticides, Aldrin, Dieldrin, DDT, Endrin, Explosives, Channels, Oil wastes, Oil spills, Industrial wastes.

Nine federal laws which regulate or prevent the discharge of toxic wastes into waterways and maintain water quality standards are reviewed. An amendment to the Federal Water Pollution Control Act regulates six toxic chemicals, including four pesticides. Some amendments set standards for oil and hazardous substance liability; effluent treatment and control compliance schedules for municipalities and industries; identification and limitation of pollutants; and new point-source discharge controls. Other amendments establish pretreatment standards for pollutants, sewage sludges, and toxins; and disposal and discharge regulations for sludge, dredge and fill material, and toxic pollutants in navigable waters. The Marine Protection, Research, and Sanctuaries Act of 1972 controls the transport and discharge of materials into the ocean. The Safe Drinking Water Act of 1974 regulates the drinking water quality after treatment and set standards for contaminant levels, odors, and appearance. Treatment, storage, and disposal of hazardous wastes, excluding nuclear wastes and materials contained in waste water discharge, are mandated under the Resource Conservation and Recovery Act of 1976. Safety and combustible materials, poisons, disease-related substances and other materials, are established by the Hazardous Materials Transportation Act of 1974. Other acts discussed that control toxic substances in water are: the Ports and Waterways Safety Act of 1972; the Federal Insecticides, Fungicide, and Rodenticide Act of 1972; the Toxic Substances Control Act of 1976; and the Atomic Energy Act of 1954. (Lisk-FIRL)
W78-04389

OIL POLLUTION IN THE MEDITERRANEAN SEA,
Mediterranean Regional Oil Combating Center, Manoel Island (Malta).
P. Le Lourd.
Ambio, Vol. 6, No. 6, p 317-320, 1977. 4 fig, 1 tab, 11 ref.

Descriptors: *Oil pollution, *Oil industry, *Oceans, Ships, *Water pollution sources, Oil wastes, Oily water, Oil spills, Waste water treatment, Marine biology, *Mediterranean Sea.

A study of oil pollution in the Mediterranean Sea revealed that the major sources of oil pollution are ballast and bilge water, tank washwater, and refinery wastes. Most tankers employ a 'load on top' separation process for the removal of oil from ballast and bilge, but the 72-hr process is economically impractical for short voyages. Of the 17 loading terminals in the Mediterranean Sea, only about half have facilities for treating ballast from tankers. It is estimated 0.5-1.0 million tons of oil per year are released into the Mediterranean. Many coastal areas in the Mediterranean Sean have reported oil-related contamination and destruction of marine organisms. Oil pollution has been shown to upset the delicate balance of oxygen and nutrients in the seawater. Several conventions have adopted regulations limiting or prohibiting oil discharge in the Mediterranean, as well as measures for cleanup and treatment of oil wastes. (Lisk-FIRL)
W78-04403

THE COORDINATED MEDITERRANEAN POLLUTION MONITORING AND RESEARCH PROGRAM,
United Nations Environment Program, Geneva (Switzerland).
S. Keckes.
Ambio, Vol. 6, No. 6, p 327-328, 1977. 17 ref.

Descriptors: *Water pollution, *Marine biology, *Industrial wastes, *Monitoring, *Research facilities, On-site investigations, Data collections, Regulation, Oceans, Pollutants, Oil pollution, Water pollution sources.

A United Nations-sponsored Mediterranean research and monitoring program is outlined. The Mediterranean Pollution Monitoring and Research Program established seven pilot projects to analyze the effects of pollutants on marine organisms and populations, and on recreational facilities. Oil hydrocarbons, chlorinated hydrocarbons, metals, and the coastal transport of pollutants are also monitored. An eighth project monitors pollution in open waters. The program is part of a four-part Action Plan for the Protection of the Mediterranean Environment adopted in 1975 by the Intergovernmental Meeting in Barcelona. Future goals include the establishment of waste disposal regulations for the Mediterranean and surrounding countries, and a system for collection and processing of data. (Lisk-FIRL)
W78-04412

EFFECTIVENESS OF SURFACE MINE SEDIMENTATION PONDS,
Hittman Associates, Inc., Columbia, MD.
For primary bibliographic entry see Field 5D.
W78-04433

RIVER BASIN WATER QUALITY SAMPLING,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04491

POPULATION OF BENTHIC MACROINVERTEBRATES IN HAM'S LAKE,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-04493

SALINITY MANAGEMENT STRATEGIES FOR THE LOWER SAN LUIS REY RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. W. Labadie, I. A. Khan, and O. J. Helweg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 030, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, September 1976. 168 p, 53 fig, 10 tab, 51 ref, append. OWRT C-6301(5229)(1).

Descriptors: *Groundwater, *Salinity, *Optimization, *Simulation analysis, *Planning, *Irrigation, *River basins, Mathematical models, Aquifer models, Pumping, Linear programming, Management, Groundwater quality, *Lower San Luis Rey River basin(Calif), California.

A salinity management study has been conducted on the lower San Luis Rey River basin in order to project the impacts of applying the Accelerated Salt TRANsport (ASTRAN) method over a 20 year planning period. The ASTRAN method is an operational approach to salinity control which encourages the application of groundwater downstream from where it is pumped. A management algorithm was developed for implementing the ASTRAN method in an optimal manner. The algorithm is composed of (1) a model simulating groundwater flow and TDS concentration, and (2) an optimizing model. General conclusions from operating the management algorithm for several salt balance levels are: (1) for the same required amount of imported water, the ASTRAN method can achieve a 50% reduction in salinity degradation rate in comparison with the normal practice in the basin of applying water where it is pumped; (2) this figure increases to up to 90% reduction with inclusion of projected availabilities of local Lake Henshaw water; (3) aside from possible investment in additional pumping capacity and unlined surface distribution systems, required capital investment is low in comparison to demineralization and tiling measures.
W78-04499

PHOSPHORUS ACCUMULATION-DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-04501

THE SIGNIFICANCE OF STORMWATER RUNOFF IN AN URBANIZING WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 5B.
W78-04512

QUALITY ASPECTS OF AGRICULTURAL RUNOFF AND DRAINAGE,
American Society of Civil Engineers, New York. Task Committee on Agricultural Runoff and Drainage of the Water Quality.
For primary bibliographic entry see Field 5B.
W78-04523

DESICCATION AND CONSOLIDATION OF DREDGED MATERIALS,
Northwestern Univ., Evanston, IL. Technological Inst.
R. J. Krizek, M. Casteleiro, and T. B. Edil.

Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 103, No. GT12, Proceedings Paper 13403, p 1399-1418, December 1977. 9 fig, 22 ref, 1 append. EPA 15070-GCK, R-880948.

Descriptors: *Dredging, *Spoil banks, *Consolidation, Desilting, Dewatering, Drying, Model studies, *Mathematical models, Evaporation, Evapotranspiration, Settlement(Structural), Moisture content, Sediments, Soils, Drainage, *Desiccation, Dredged materials, Hydraulic fills, *Toledo(Ohio).

A mathematical model, which numerically solves the boundary value problem representing these physical phenomena, was applied in conjunction with the results of an extensive experimental investigation: (1) calculate the settlements that are predicted for the dredged materials placed in the Penn 7 disposal area in Toledo, Ohio; and (2) to evaluate the effect that modifications in the boundary conditions have on the consolidation behavior of the fill. Although drainage conditions at the bottom of the layer do exert some influence on the consolidation rate during deposition on the dredgings, the evapotranspiration potential renders this effect almost negligible when desiccation takes place at the surface. On the other hand, transpiration plays an important role on the consolidation rate during the early stages of desiccation, but this effect is reduced considerably as the water table approaches an equilibrium position. Theoretical results indicated that significant improvement in the consolidation behavior of dredged materials apparently can not be achieved with low cost modification in the boundary conditions, but the use of vegetation with high transpiration rates appears to offer considerable promise. (Sims-ISWS)
W78-04525

STATE-OF-THE-ART SURVEY AND EVALUATION OF OPEN-WATER DREDGED MATERIAL PLACEMENT METHODOLOGY,
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-04533

DREDGED MATERIAL RESEARCH PROGRAM, THIRD ANNUAL REPORT.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W78-04534

THE ROLE OF ALKALINE RESERVE IN MINERALIZATION OF ORGANIC SUBSTANCES. (IN RUSSIAN),
Miniskii Meditsinskii Inst. (USSR).
N. A. Boldina.
Zdravookhr Beloruss. Vol 18, No 5, p 54-56. 1972.

Descriptors: Albumin, Ammonification, Decomposition, Fecal, Mineralization, Organic wastes, Sewage, Water pollution, Soils, *Decomposing organic matter, *Alkaline soils.

The rate of decomposition of organic substances in soils is determined by soil aeration, soil type and chemical composition of the organic substances. Mineralization of those organic substances occur optimally when their acidic and basic components are in equilibrium; this process is retarded by excess acidity. In soils buffered with alkaline reserve, the capacity for self-purification is much greater than in unbuffered soils. Albumen (egg source unspecified) was dissolved in a solution of N and household fecal sewage water. Aqueous extracts of garden soil were added for seeding (unspecified) soil microflora. Marble powder or quarz powder were also added to vials, which were aerated and maintained at room temperature. Ammonification started in 3-5 days in all vials, but oxidation into nitrites was completed at the end of the 4th month in vials with marble, while the ammonia in the quartz vials was preserved to the end of the 1st yr. The rate of nitrate formation was 3-4 times higher in vials with alkaline reserve (marble) than in those with quartz. The indicators of oxidizability and biochemical O consumption are 30-40% lower in vials with marble. One of the indicators of the course of mineralization of sewage water is the value of their relative stability. The indicator of the stability of the solutions. The ability to control processes of natural organic decomposition is important in both artificial and natural (environmental) purification.--Copyright 1974, Biological Abstracts, Inc.
W78-04538

PHOSPHORUS ACCUMULATION--DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04545

BEST MANAGEMENT PRACTICE FOR URBAN STORM AND COMBINED SEWER POLLUTION CONTROL,
C. B. Murphy, Jr., F. J. Drehwing, T. A. Jordan, and D. J. Carleo.
Water and Sewage Works, Vol 124, No 11, p 81, November, 1977.

Descriptors: *Combined sewers, *Storm water, *Urban runoff, *Sewerage, *Storm runoff, Costs, Water pollution control, Sewers, Suspended solids, Equipment, Waste water treatment.

Since non-point sources are major contributors of urban water pollution, interest has been directed toward the control of storm water and combined sewer overflow discharges. The application of Best Management Practices (BMP) has been suggested as a rational and cost-effective solution to the abatement of both storm water and combined sewer overflow. Surface flow attenuation, porous pavement, erosion control, restrictions on chemical usage, land-use planning, and improved sanitation practices are suggested as abatement measures in source management. Collection system management alternatives include: inflow/infiltration control, improved system regulation and control, polymer addition for friction reduction, and collection system maintenance programs. Conventional vacuum sweepers have been recommended for removing the light fraction of total suspended solids from storm water. Hydraulic analyses of the collection system are recommended for a program of collection system management. (Schulz-FIRL)
W78-04552

EVALUATION OF STORM WATER ROUTEING MODELS,
MacLaren (James F.) Ltd., Toronto (Ontario).
N. A. Zaghoul.
Proceedings of the Institute of Civil Engineers (London), Vol 63, Part 2, p 925-933, December, 1977. 6 fig, 9 ref.

Descriptors: *Storm water, *Routing, *Streamflow forecasting, *Runoff, *Hydrographs, Hydrograph analysis, Rainfall, Rainfall-runoff relationships, Inflow, Diversion structures, Discharge(Water), Municipal wastes, Watershed management, Waste water treatment, Overflow, Canada.

Three storm water transport routing systems were compared. The Dorsch hydrograph volume method (HVM), the Water Resources Engineers' model (WRE), and the storm water management model (SWMM) were evaluated using the same runoff inlet hydrographs. The three models were tested in simulation studies with the Bannatyne combined sewer water shed in Winnipeg, Ontatio, Canada. The 542-acre Bannatyne watershed was divided into 41 subcatchments, ranging in size from 5 to 23 acres and in imperviousness from 23 to 75%. Transport routes were compared under normal flow conditions. Outflow hydrographs predicted by the models were compared to the outflow hydrographs recorded during a storm of low intensity and long duration and during a storm of medium intensity and short duration. The evaluation indicated that the SWMM model was not as accurate under surcharge conditions and should be used primarily in studies of storm water management and planning. The Dorsch HVM and WRE models provided more realistic storm sewer network designs. (Lisk-FIRL)
W78-04554

$4.7 BILLION FOR SAO PAULO SEWERS MARKS INVESTMENT SHIFT BY BRAZIL.
Engineering News-Record, Vol 199, No 25, p 44, December, 1977. 1 fig.

Descriptors: *Sewage treatment, *Activated sludge, *South America, *Treatment facilities, *Sewerage, Biological treatment, Economics, Municipal wastes, Waste water disposal, Waste water treatment, *Brazil.

Sao Paulo, Brazil, will soon begin to build its first comprehensive sewage collection and treatment system. Construction of the system will take place in stages and continue through the year 2000. Today, only 38% of Sao Paulo is served by sewers; and only 5% of the sewage receives primary treatment. The new system, when completed, will collect 90% of the sewage and subject it to secondary treatment. The 3300 mi collection system will be built by local contractors. The treatment equipment is to be purchased abroad. The stage of Sao Paulo allocates over 40% of its total capital budget to public health and sanitation projects. Sewage comprises 25% of the flow of the River Tiete which ultimately empties into a reservoir providing part of Sao Paulo's drinking water supply. Treated water will enter the Tiete after 1983, when the first waste treatment plant is scheduled to begin operation. Activated sludge will be used, but new treatment technology will be incorporated wherever possible. Engenharia de Projectos, Ltda., a local firm, prepared the master plan. Technical advice was provided by: Metcalf and Eddy, Incorporated, Boston; experts from Capetown University in South Africa; the Thames Water Authority in England; and the Ruhr Valley Pollution Control agency in West Germany. (Snyder-FIRL)
W78-04555

INTERNATIONAL PIPE PROTECTION CONFERENCE.
For primary bibliographic entry see Field 8G.
W78-04556

BREATHING NEW LIFE INTO POLLUTED WATERS.
Chemical Week, Vol. 121, No. 20, p 47-48, November, 1977.

Descriptors: *Aeration, *Water pollution control, *Pollution abatement, *Dissolved oxygen, *Treatment facilities, Environmental effects, Oxidation, Waste water treatment, *France.

A new plan has emerged for on-site clean-up of polluted rivers and lakes. The process employs ships equipped with liquid oxygen aeration units. Two Oxynautes have been built and tested successfully on the Seine and Deulle Rivers in France. The larger of the two ships, the Poseidone C 1000 can treat 5,800 liters of waste water/sec. The Poseidonie C 500 treats 2,900 liters/sec. The process can be applied to municipal wastes as well as industrial wastes containing hydrocarbons. In the continuous treatment process on board ship, turbine-propelled blades mix liquid oxygen with waste waters pumped into a shipboard mixing chamber. Mixing is done under pressure to create

high dissolved oxygen levels in the water. The oxygenated water returned to the waterway provides an environment suitable to bacterial consumption of organic wastes. Dissolved oxygen levels in the range of 0.3-10.0 mg 02/liter of waste water are required for the process. (Baker-FIRL)
W78-04580

UTILIZATION OF WASTEWATER RESIDUES TO RECLAIM DREDGED EMBANKMENTS,
For primary bibliographic entry see Field 5E.
W78-04585

THE GREAT LAKES CLEANUP,
International Joint Commission-United States and Canada. Great Lakes Regional Office.
K. H. Walker.
Water and Sewage Works, Vol. 124, No. 11, p 85, November, 1977.

Descriptors: *Great Lakes, *Water pollution control, *Environmental effects, *Phosphorus, *Waste water disposal, Phenols, Aquatic life, Absorption, Water quality standards, Fish, Path of pollutants.

The 1972 Great Lakes Water Quality Agreement was adopted to ensure effective pollution control via Canadian and American programs. One of the major goals of the project was to reduce phosphorus inputs and control eutrophication in the Great Lakes. Effluent standards for municipal waste water discharge have been set at 1.0 mg/liter for plants discharging in excess of 1 mgd. Although phosphorus loadings have decreased since 1975, to date only 9 of the 44 municipal waste water treatment plants are meeting phosphorus standards. Current activities of the International Joint Commission have been directed toward evaluating the use of sodium nitriloacetate as a replacement for phosphorus in laundry detergents. The commission also plans to provide information on Great Lakes water quality and the persistence of toxic chemicals in the Great Lakes ecosystem. (Schulz-FIRL)
W78-04586

WATER RECLAMATION--QUALITY TARGETS AND ECONOMIC CONSIDERATIONS,
National Inst. for Water Research, Pretoria (South Africa).
L. R. J. van Vuuren.
Water SA, Vol. 1, No. 3, p 133-143, October, 1975. 4 fig, 10 tab, 6 ref.

Descriptors: *Water reuse, *Water quality standards, *Water costs, *Competitive prices, *Treatment facilities, Sewage treatment, Africa, Municipal wastes, Industrial wastes, Waste water treatment, Waste water disposal, South Africa.

In Southern Africa, secondary effluents have been reclaimed for industrial and other purposes for some time. Most effluents from conventional sewage treatment plants have marked diurnal and seasonal variations in quality with regard to ammonia nitrogen, organic carbon, and alkalinity. Mineral quality, ammonia nitrogen, dissolved organic constituents, and suspended solids all affect the suitability of water for reuse. During recent years advanced treatment technology for waste water reclamation has progressed considerably. The Windhoek and the Stander waste water reclamation plants in South Africa each treat 4.5 Mliters/day using lime treatment and carbon filtration. It is possible to produce water meeting World Health Organization standards at a approximate cost of 10 South African cents/kiloliter. Alum and polyelectrolyte addition were used at another plant to improve treatment of waste water for reuse in pulp bleaching operations. The reuse of waste water for industrial purposes is possible at competitive prices and would be a rational way to deal with increasing water demands. Strict operational control of reclamation plants is required to produce potable water. Improved sewage treatment processes and separation of toxic industrial wastes can greatly reduce risks. (Snyder-FIRL)
W78-04597

PUBLIC HEALTH ASPECTS OF LAND UTILIZATION OF WASTEWATER EFFLUENTS AND SLUDGES,
Johns Hopkins Univ., Baltimore, MD.
For primary bibliographic entry see Field 5E.
W78-04604

'USED' WATER USED AGAIN FOR IRRIGATION.
Crops and Soils Magazine, Vol. 30, No. 3, p 24, December, 1977.

Descriptors: *Irrigation, *Return flow, *Cultivated lands, *Water reuse, *Water conservation, Recycling, Municipal wastes, Sewage treatment, Waste water disposal, Waste water treatment.

Irrigation of farmland has been suggested as a means of recycling large amounts of sewage treatment effluent, especially in California. California procudes 1.7 million acre-feet of reusable waste water annually. Currently, two-thirds of this is discharged directly into the ocean or estuaries. Municipal waste water has already been used to irrigate small areas of farmland owned by California sewage treatment agencies. Water supply and water treatment systems are usually coordinated by different agencies, making cooperative planning difficult. Major waste water sources are also usually located some distance from farming operations which need supplemental water. There are also uncertainties involving benefits and costs, crop yields, and soil and water resources. Some stable organic compounds found in waste water may be dangerous. Ideally, both the farmer and the city should benefit from waste water reclamation for irrigation. (Snyder-FIRL)
W78-04605

JURY ON LAND DISPOSAL OF WASTEWATER STILL OUT, MR. COSTLE,
S. Baxter.
The American City and County, Vol. 92, No. 12, p 28, December, 1977.

Descriptors: *Treatment facilities, *Land use, *Public health, *Water Pollution Control Federation, *Adoption of practices, Municipal wastes, Biological treatment, Conferences, Waste water disposal, Waste water treatment.

Health aspects of waste water and residual disposal on land were discussed at the Water Pollution Control Federation's (WPCF) 1977 annual conference. The Environmental Protection Agency (EPA) will urge publicly-owned treatment plants to use land treatment to reclaim and recycle municipal waste water. The engineer designing a treatment plant must present evidence against the feasibility of land application before standard mechanical and biological treatment processes can be adopted. The health problems associated with land disposal are not entirely understood. It is not known whether experience with land disposal in Muskegon, Michigan, will be sufficient to ensure 1983 and 1985 water pollution abatement goals. Land disposal should only be considered when the facility is properly operated and efforts are made to use sound engineering, geological, farming, areal, meteorological, and econimic expertise in design, construction, and control procedures. Many of the narrow viewpoints stem from arbitrary legal and regulatory provisions. (Snyder-FIRL)
W78-04606

OPERATION AND MAINTENANCE OF POLLUTION CONTROL EQUIPMENT,
F. L. Cross, Jr.
Pollution Engineering, Vol 9, No 12, p 52-55, December, 1977. 1 fig, 2 tab, 1 ref.

Descriptors: *Activated sludge, *Operation and maintenance, *Treatment facilities, *Air pollution, *Monitoring, Waste water treatment, Environmental engineering, Management, Sludge treatment, Equipment.

Proper maintenance techniques for the efficient operation of pollution control facilities are outlined. Initially, the guidelines recommend an inventory of all equipment by maintenance crews or outside consultants. A monthly maintenance report is suggested as a record of servicing, failures, and costs. Maintenance of the activated sludge system involves the recognition of problems such as sludge bulking, erratic sludge volume, difficulty in maintaining balanced mixed liquor and dissolved oxygen in aeration tank, and excessive foam in aeration tanks. The establishment of a floating maintenance man or crew for regional area air pollution equipment is recommended. Routine maintenance of incineration equipment is advised for preventing major breakdowns. Regulations governing sanitary landfill use and maintenance and a routine check of potential problems are suggested. (Lisk-FIRL)
W78-04618

EVALUATING WASTEWATER FACILITY STAFFING NEEDS,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, CA.
G. Culp, H. H. Benjes, Jr, and J. Puntenney.
Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2226-2237, November, 1977. 15 tab, 2 ref.

Descriptors: *Personnel management, *Manpower, *Treatment facilities, *Operation and maintenance, On-site data collections, Waste water treatment.

Plans to expand the Metropolitan Denver Sewage Disposal District (MDSDD) secondary treatment facilities from a 98-mgd to a 170-mgd capacity led to a study on staffing needs. The program included a comparison with available staffing guidelines, comparisons with other plants, on-site interviews of existing MDSDD personnel, and recommendations of appropriate staffing levels. The various findings of this survey are reported. By reviewing work tasks, the minimum staff requirement was estimated as 177. The preliminary MDSDD plan had provided for 199 positions, a level of staffing guidelines agreed with MSDSS's preliminary staffing plans for their expanded facility. It was determined that the 22 positions could be left unfilled until a definite need was demonstrated. The results of this survey indicated the need for a thorough study of a specific plant's needs for an accurate estimation of staff requirements. (Baker-FIRL)
W78-04642

ENVIRONMENTAL PROBLEMS OF INDIA AND THEIR POSSIBLE TRENDS IN FUTURE,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. K. Parikh.
Environmental Conservation, Vol. 4, No. 3, p 189-198, Autumn 1977. 1 fig, 5 tab, 13 ref.

Descriptors: *Environmental effects, *Water pollution control, *Foreign countries, *Public health, Environmental sanitation, Sewerage, Water supply, Population, Water pollution effects, Waste water treatment, Waste water disposal.

Environmental problems in India and their possible influence on the future are reviewed. The anticipated population growth, increased industrial and agricultural activities, and depletion of natural resources are expected to present serious problems over the next 25 years. The quality of the

air, water, sanitation, health, and housing are considered. A quantitative outline is presented for various conservation techniques for forests, soils, and wildlife. Two of the most serious problems in India are water pollution and deforestation. Presently, in rural areas, less than 10% of the population is served by existing water distribution and waste water treatment systems. Unless drastic measures are taken, this percentage may not exceed 30% by the year 2000. The lack of adequate sewerage and sanitation facilities could lead to severe degradation of existing water supplies. Further consideration of the effects of agricultural runoff containing wastes, pesticides, and fertilizers on rural water sources is also suggested. (Baker-FIRL)
W78-04643

SEWERAGE COSTS RISING AT A FASTER PACE.
Engineering News-Record, Vol. 199, No. 25, p 102, December, 1977. 3 tab.

Descriptors: *Cost comparisons, *Costs, *Waste water treatment, *Economics, *Treatment facilities, Economic prediction, Municipal wastes.

Construction costs for waste water collection and treatment facilities in the United States are reported by the Environmental Protection Agency to have taken a sharp rise in the third quarter of 1977. This rise in cost parallels a similar increase in the concrete pipe and lumber industries. For 25 cities across the United States having waste water treatment plants of the 5-mgd treatment size, cost indexes averaged 126.3 in the July-September period, up 2.5% from the previous quarter. For 50-mgd treatment plants, costs indexes averaged 138.5, a 3.2% increase over second-quarter figures. Cost indexes for complete urban sewer systems averaged 143.2 in the third quarter, up 3.4% from the April-June period. (Baker-FIRL)
W78-04644

COMMUNITY ACTION ON WATER POLLUTION,
Cook Coll., New Brunswick, NJ. Dept. of Human Ecology.
J. J. Friedman.
Human Ecology, Vol. 5, No. 4, p 329-353, 1977. 2 tab, 48 ref.

Descriptors: *Environmental control, *Grants, *Waste water treatment, *Industrial wastes, *Sewage disposal, Municipal wastes, Water pollution control, Government supports, Local governments, Treatment facilities, Costs.

A community's progress toward the institution of water quality control is relative to the influence of polluting industries on the community, the cost-benefit factors, and the characteristics and needs of the community. Options available to communities for pollution control include EPA grants for the construction of new treatment facilities, HUD's Water and Sewer Facilities Program providing matching grants for sewers and waste disposal facilities, and the adoption and enforcement of regulations restricting pollution through industrial wastes. The benefit of these alternatives is considered collective, or shared by the entire community. Cost, however, may be more specific, falling mainly upon the users of treatment facilities and polluters, such as local industry. Opposition by local industry can influence the action taken by a community toward pollution control. Other factors that influence a community's application for waste control grants include location, need, population potential, and resources. (Lisk-FIRL)
W78-04645

DAMAGE TO POLLUTED LAKES CAN BE REVERSED, STUDY SAYS.
Water and Waste Engineering, Vol. 14, No. 12, p 35, December, 1977.

Descriptors: *Phosphorus, *Freshwater, *Aquatic algae, *Tertiary treatment, *Sewage disposal, Eutrophication, Reservoirs, Agricultural runoff, Waste water treatment, Water quality, Detergents.

A study by a group of Cornell University researchers has concluded tht dissolved phosphorus presents the major threat to freshwater lakes and that the pollution can be reversed. Erosion, which contributes undissolved phosphorus to water, is not as serious a threat to the water quality as dissolved phosphorus, which controls the growth of algae. This conclusion contradicts federal guidelines. Sewage is cited as the primary source of dissolved phosphates, originating from the use of phosphate detergents. Prohibiting use of these detergents and instituting tertiary treatment of wastes provide the most economical control. Water quality regulations should meet the needs of individual watersheds and their biological characteristics. Removal of phosphorus input from agricultural drainage and unsewered areas was found to be more costly than the other controls and treatment. Public awareness and concern is also considered. (Lisk-FIRL)
W78-04646

PHOSPHATE PROBLEMS COME TO THE UNITED KINGDOM,
For primary bibliographic entry see Field 5D.
W78-04647

CALIFORNIA TAKES HALTING LEAD ON SEWAGE PLANT CM.
Engineering News-Record, Vol. 200, No. 3, p 53, January, 1978.

Descriptors: *Construction, *Management, *Treatment facilities, *California, *Grants, Project planning, Design, Projects, Sewage treatment, Waste water treatment.

California now requires applicants for federal waste water treatment construction grants to submit plans for construction management of projects costing over $5 million. Separate construction managers are not required. This approach allows for project vanability and flexibility. The Environmental Protection Agency (EPA) has delegated more responsibility for water pollution control to California than to any other state. California and the EPA believe that a reduction in change orders and delays will more than offset any additional costs incurred by retaining a construction manager. The EPA is sending other states information about the program and encouraging them to adopt similar requirements. The EPA may order construction management at a later date. (Snyder-FIRL)
W78-04648

EPA HALTS AWARD.
Engineering News-Record, Vol. 199, No. 25, p 46, December, 1977.

Descriptors: *Bids, *Supply contracts, *Sewage treatment, *Sewerage, *Treatment facilities, Municipal wastes, Specifications, Administration, Equipment, Waste water treatment.

The Environmental Protection Agency (EPA) postponed funding of an $80 million waste water treatment plant. The action was in response to bid specifications requiring performance bonds covering equipment from potential suppliers which were considered too restrictive. Officials of the Passaic Valley Sewerage Commission felt that the ruling would unnecessarily delay construction of a $500-million treatment plant in Newark, New Jersey. It might also prevent New Jersey from meeting a federal deadline of December 31, 1989, to end ocean dumping of sludge. The specifications required suppliers of the thermal sludge conditioner to have at least 5 years of experience with the equipment or to post a bond to guarantee the system's performance for 5 years. According to the commission, an inexperienced supplier might install a system having defects which would not be found during construction or initial testing. Only two United States firms currently manufacture the wet air oxidation system: Zimpro Inc., of Rothschild, Wisconsin; and Envirotech Corp., in Menlo Park, California. The EPA had initially approved the experience requirement, but decided later that it only inhibited free competition. The Passaic Valley Sewerage Commission has contemplated appealing the EPA ruling. (Snyder-FIRL)
W78-04650

SEWER USE CHARGE SURVEY REVEALS WIDELY DIVERGENT POLICIES,
Charlotte/Meklenburg Utility Dept. Charlotte, NC.
L. S. Dukes, and R. R. Moore.
Public Works, Vol 108, No 12, p 48-49, 83, December, 1977. 2 fig, 2 tab.

Descriptors: *Pollution taxes(Charges), *Sewerage, *Costs, *Operation and maintenance, *Capital costs, Municipal wastes, Treatment facilities, Sewers, Waste water treatment.

A survey was taken to compare the current and proposed sewer use charge rates employed by the Charlotte-Mecklenburg Utility Department in Charlotte, North Carolina, with those of other cities with similar facilities. Information was obtained from 74 publicly-owned systems. The largest was Los Angeles with 455-mgd capacity; the smallest was New London, Connecticut, having a 6-mgd system. The survey solicited information on financing for operation, maintenance, and repair. Funding for capital expansion of collection and treatment systems was assessed. Charges based on waste water volume were significantly different for the various utilities. For a monthly volume of 1,000 cu ft, charges ranged $0.98-8.68 for users inside city limits and $3.02-13.00 for users outside city limits. Corresponding charges for a monthly volume of 100,000 cu ft were $71.65-531.50 and $103.25-1478.20, respectively. (Baker-FIRL)
W78-04651

REGIONAL WATER QUALITY PLANNING: A VIEW FROM SOUTHEAST MICHIGAN,
R. P. Akeley, Jr., P. G. Collins, C. D. Harlow, and J. W. Ridgway.
AIChE Symposium Series, Vol 73, No 167, p 288-296, 1977. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Waste water disposal, *Municipal wastes, *Sewage treatment, *Sewerage, Analytical techniques, Treatment facilities, Planning, Water quality, *Michigan.

The Southeast Michigan Council of Governments (SEMCOG) received $5.1 million to produce a plan for water quality management for the Detroit metropolitan region. Data requirements were extensive. Water quality models include: STORM-LLODS, a precipitation-runoff screening model; QUAL II, a stream quality routing model; and RUNQUAL, which routes surface runoff plus base flows through a converging, branching network of pipes of channels. Southeast Michigan has a complicated mixture of point, nonpoint, and intermittent point sources of pollution. Facilities planning was to include carful technical reviews, improved cooperation with the local units, close communication with the state clearinghouse, integration of facilities reviews and development of the water quality management plant, cooperation during facilities plan development, and a sewer service area map. Population forecasts were necessary for anticipating appropriate service area boundaries. The Council was given 2 given 2 years in which to create a plan that was both technically sound and implementable. (Snyder-FIRL)
W78-04652

EVALUATION OF 'CAM-I', A WARNING DEVICE FOR ORGANOPHOSPHATE HAZARDOUS MATERIAL SPILLS,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5A.
W78-04679

A REGIONAL WATER QUALITY MONITORING SYSTEM,
Minneapolis Metropolitan Sewer Board of the Twin Cities Area, Md.
For primary bibliographic entry see Field 5A.
W78-04687

AN AIRBORNE LASER FLUOROSENSOR FOR THE DETECTION OF OIL ON WATER,
National Aeronautics and Space Administration, Wallops Island, VA. Wallops Station.
For primary bibliographic entry see Field 5A.
W78-04689

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUBOPTIMUM WEATHER,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04693

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

APPLICATIONS FOR SOUTH CAROLINA'S WETLANDS OF A GENERAL MODEL OF EFFICIENT SOLUTIONS TO EXTERNALITIES,
Clemson Univ., SC. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W78-04368

AN APPLICATION OF INTERACTIVE MULTIOBJECTIVE WATER RESOURCES PLANNING,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
D. P. Loucks.
Interfaces, Vol. 8, No. 1, p 70-75, November, 1977. 2 fig, 2 ref.

Descriptors: *Water resources, *Multiobjective planning, *Irrigation efficiency, *Optimization, Decision making, Northern Africa, Conflicting objectives, Water yield maximization, Reliability maximization, Cost minimization, Projects, Alternative planning, Pipelines, Reservoirs, Constraints, Design, Iterative process, Mathematical models, Systems analysis.

A national goal in northern African countries is to increase agricultural production. In particular, a country is considering the construction of a rather large network of reservoirs, pipelines, pumping stations, and water treatment plants that would capture, treat and pump back much of the water normally discharged into the Mediterranean Sea. This water, supplemented by desalinated water from the Mediterranean would be transported to the interior of the country for irrigation use. This paper discusses the derivation of a single best preliminary plan for each irrigation area through the use of interactive multiobjective optimization methods. The iterative process involves the use of some dynamic multiobjective models for the generation of successive solutions that satisfy changing criteria established by decision makers of the host country. This process has enabled government officials to choose what they consider as the best compromise between three conflicting objectives: maximum water yield; maximum yield reliability; and minimum total cost. (Bell-Cornell)
W78-04476

CONTROL TARGETS FOR THE MANAGEMENT OF BIOLOGICAL SYSTEMS,
Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
T. L. Vincent, C. S. Lee, and B. S. Goh.
Ecological Modelling, Vol. 3, No. 4, p 285-300, October 1977. 27 ref.

Descriptors: *Fish harvest, *Management, *Biological systems, *Control targets, Isochronal systems, Cost minimization, Cost functions, Time intervals, System trajectory, Equations, Mathematical models, Systems analysis, *Optimization.

Attention is focused on biological systems which are describable in terms of ordinary differential equations subject to human control inputs. The concept of an isochronal system is introduced in order to include systems for which the differential equations are valid only over regularly recurring time intervals. It is assumed that the control inputs are to be chosen so that an integral cost function of the state of the system, the control used, current time, and the time interval of the control program are minimized. Problems associated with minimizing this cost function over an infinitely long time interval are then considered. Difficulties inherent with minimizing a cost integral on an infinite time interval are shown to be avoided by minimizing an average of the cost function over an unknown but periodic time interval. Under proper circumstance, the optimal control program for the average cost function, is either identical or a good approximation to the optimal control program for the original cost function over an infinitely long time interval. Necessary conditions are obtained for minimizing an average cost function over an unspecified time interval subject to the system equations. For a given problem, the necessary conditions will yield but a single system trajectory in the state space. For management purposes, this trajectory may be seen as a target to which the system should be driven and maintained. Examples in the field of fish harvesting illustrate the use of the necessary conditions to obtain control targets. Certain problems associated with the stability of the target solutions are illustrated with the examples. (Bell-Cornell)
W78-04477

THE ALL-PURPOSE MATHEMATICAL MODEL,
New York State Dept. of Environmental Conservation, Albany. Div. of Pure Waters.
H. H. Bagley.
Clearwaters (New York Water Pollution Control Association), Vol. 6, No. 4, p 12-13, December 1976.

Descriptors: *Mathematical models, *Water pollution, *Simulation analysis, Systems analysis.

The mathematical model is valid for only a geomorphology identical to that where the natural physical phenomena is observed. While it is true that the model is useful for determining values for the several unknown parameters under predictive situations by introducting finite mass balances for known variables, a model rarely serves as a matter of interest to more than a single client. This article describes the author's experimentation with the concept of an all-purpose mathematical model in order to overcome this obvious deficiency. The matrix used in the application of the All-Purpose Mathematical Model (APMM) is given. (Bell-Cornell)
W78-04478

CHARACTERISTICS OF THE SOLUTION ALGORITHMS FOR THE QUAL II RIVER MODEL,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5B.
W78-04479

GENERAL OVERVIEW OF APPLICATION OF STOCHASTIC METHODS TO WATER RESOURCES PROBLEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Chapter 1, p 1-1--1-46, 1976. 13 fig.

Descriptors: *Water resources, *Stochastic processes, *Analytical techniques, *Probability, *Mathematical statistics, *Water storage, Equations, Systems analysis, Estimating, Planning, Operating rules.

The overview is divided into five sections. The first is a discussion of broad concepts which demonstrate the need for stochastic methods in solving water resources problems. Considered are: data on water supply and demand; relations of processes and decisions; risks and uncertainties; concepts of noise; types of water management; the idealistic-deterministic approach; operational rules; stochastic optimization; and planning. The second part reviews some applications of the probability theory topics, stressing the problems to which they may apply. Discussed are: permutations and combinations; geometric probabilities; theorem of total probability; Bayesian theorem; limit theorems; and Chebishev inequality. The third section deals with the application of mathematical statistics in water resources. Considered here are: estimation of probability distributions of random variables; types of variables, series, and processes; and parameter estimation. Part five discusses the application of stochastic processes, including spectral and cross spectral analysis. Finally, methods available for solving water storage problems are classified into three major groups: (1) empirical (practical, historic, engineering); (2) analytical (theoretical, mathematical); and (3) experimental (Monte Carlo, statistical, data generation, synthetic hydrology, stochastic simulation). Various components of these three methods are discussed. (See also W77-10439) (Bell-Cornell)
W78-04482

STRUCTURE OF WATER USE TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 3, p 3-1--3-45, 1976. 24 fig, 8 tab, 15 ref.

Descriptors: *Water use, *Time series, *Water demand analysis, *Stochastic processes, Mathematical models, Equations, Systems analysis, Irrigation, Data, Temperature, Precipitation, Transient components, Mean and standard deviation, Periodic components, Autocorrelation coefficients, Linear relationship, Cross correlation function.

Water demands for cities, irrigation, power or other sources are extremely important elements of water resources planning. A lengthy introductory section explains water use time series (WUTS). Considered are: the significance of proper analysis and description of WUTS; it general characteristics; definitions of water uses and of their relation to irrigation and hydropower, as well as to navigation, recreation and water quality control; the general composition of WUTS; and sources of determinism and of stochasticity in WUTS. The next section deals with the identification, description, and removal of transient and periodic components. Discussed are mean and standard deviation and autocorrelation coefficients. Next, the chapter considers dependent and independent stochastic components. A general, deterministic-stochastic model for the analysis of WUTS is outlined which permits: the identification, estimation

and removal of trens in the mean and standard deviation; the periodic mean; standard deviation and autocorrelation coefficients; the time dependence structure; and thus the reduction of the original nonstationary process to a second-order stationary independent process. The next section considers the dependence between stochastic components of water use and climatologic series. Discussed are the linear relationship between series and the relation between water use series, temperature, and precipitation. Finally, examples of explained variables (variance by trends) are given. (See also W77-10439) (Bell-Cornell)
W78-04483

APPLICATION OF STOCHASTIC METHODS IN WATER RESOURCES STUDIES,
Texas Univ. at Austin. Center for Research in Water Resources.
L. R. Beard.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 7, p 7-1--7-13, 1976. 5 fig, 1 tab.

Descriptors: *Stochastic processes, *Water resources, *Projects, *Planning, *Design, Data fill-in, Hydrologic events, Simulation analysis, Texas Water Plan, Saskatchewan-Nelson Basin, Long-term droughts, Extreme droughts, Hydrologic data, Tandem stations, Monthly streamflow, Mathematical models, Equations, Systems analysis.

Planners and engineers are reluctant to use stochastic methods in dealing with water resources projects. This may be due to: (1) unfamiliarity with the available techniques; (2) inadequacy of available techniques; and (3) available techniques not having been tested and demonstrated. This chapter explains some problems in the application of stochastic methods to actual water resources studies, such as the Texas Water Plan and the Saskatchewan-Nelson Basin, and presents some problem solutions. Water project planning and design is still based generally on the assumption that a project need perform adequately only under recurrence of past hydrologic events as adjusted for future changes in basin conditions upstream. But the highly complex nature of a water resources project produces a need for stochastic methods; they are of greatest value in the simulation of project performance for conservation purposese (non-flood-control). Since a very large number of calibration coefficients is required for any realistic stochastic model of hydrologic events, mathematical techniques must be devised to overcome the effects of short records and incomplete data matrices; also, computation requirements must not be excessive. A monthly simulation program has been developed by the Corps of Engineers in order to conform with the requirements for a practical stochastic model for the study of long-term droughts. Studied are data fill-in and its value, long-term droughts, and tandem station problems. (See also W77-10439) (Bell-Cornell)
W78-04484

RISK AND UNCERTAINTY AS OBJECTIVES IN WATER RESOURCES,
Colorado State Univ., Fort Collins.
W. A. Hall.
In: Stochastic Approaches to Water Resources, Vol i. Edited and published by H. Shen, Colorado State University, Fort Collins, Col., Chapter 8, p 8-1--8-13, 1976. 1 tab, 5 ref.

Descriptors: *Water resources, *Planning, *Management, *Risks, *Optimization, *Surrogate Worth Trade-Off method, *Stochastic processes, Reservoir storage, Minimization, Maximization, Equations, Mathematical models, Systems analysis.

Water resources management has many incommensurable objectives. This chapter briefly discusses basic approaches to risk and uncertainty as objectives in water resources planning and management. Considered is the form of the risk objective. The Surrogate Worth Trade-Off (SWT) method is developed to deal with risk optimization and is found to be a powerful tool. If the proper definition of risk can be formulated in terms of the decisions x or their results, and if these can be optimized subject to constraints, then the SWT method can always be utilized to determine the superior levels of risk and returns for the decision maker. (See also W77-10439) (Bell-Cornell)
W78-04485

OPTIMIZATION AND UNCERTAINTY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
In: Stochastic Approaches to Water Resources, Vol 1. Edited and published by H. Shen, Colorado State University, Fort Collins, Vol, Chapter 9, p 9-1--9-37, 1976. 6 fig, 3 tab, 15 ref.

Descriptors: *Optimization, *Risks, *Water resources, *Stochastic processes, *Dynamic programming, *Decision theory, *Marginal analysis, Cost minimization, Benefit maximization, Reservoirs, Linear decision rule, Chance-constrained programming, Water supply, Scheduling, Equations, Mathematical models, Systems analysis.

After a consideration of natural versus man-made uncertainty and types of uncertainties (including those governed by laws of chance and those due to the randomness of nature or to the ignorance state of nature), this chapter deals with the effects of uncertainty in the choice of an objective in the optimization procedure. Decisions and consequences of decisions with uncertainty are discussed using illustrated examples. A particular method of solution--dynamic programming from a functional viewpoint--is described for sequential decision making. Marginal analysis with both deterministic and uncertain futures, future empirical decision values for various cases, and Masse's recurrence theory of marginal expectations are discussed. Examples include both cost minimization and benefit maximization problems, the problem of stocking water to meet a random demand, and the operation of a single reservoir. It is concluded that most water resources problems can be viewed as scheduling problems with uncertain and therefore variable supply. There are no standard approaches to optimization under uncertainty; the particular formulation selected will depend on the actual characteristics of the system under investigation. (See also W77-10439) (Bell-Cornell)
W78-04486

WATER RESOURCES PLANNING (AN ILLUSTRATION ON MANAGEMENT OF SURFACE AND GROUNDWATERS),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 10, p 10-1--10-61, 1976. 9 fig, 6 tab, 61 ref.

Descriptors: *Water management(Applied), *Planning, *Risks, *Mathematical models, *Hydrology, *Operations research, *Stochastic processes, Optimization, Linear programming, Simulation analysis, Equations, Methodology, Legal aspects, Conjunctive use, Surface waters, Groundwater, Colorado, River regulation, Flow, Economics, Wells, Farms, Constraints, Benefit maximization, Stream-aquier systems, Runoff, Pumping.

Whereas Chapter 9 of this volume discusses in general terms a number of approaches to optimization and uncertainty in water resources planning, this chapter considers in detail a few such approaches and demonstrates their application in case studies. Discussed first are legal problems related to management of surface and groundwaters in Colorado, litigation in Colorado, the State Engineer's tasks, economic contexts, and hydrologic uncertainties. Then two types of groundwater models--the simulation (traditional) model and kernal models--are briefly compared. Considered is stream-aquifer interaction. Next a model is developed and various strategies to manage the model are described. Presented are the derivations necessary for the model, which predicts simultaneously the two-dimensional evolution of drawdown and flow in the aquifer, the one-dimensional propagation of a flood in the river channel, and their interaction. The moments of the statistical distribution of the minimum storage are ordered by simulation. A combinatorial solution of the Kuhn-Tucker conditions leads to the piecewise linear relations between the minimum storage and the weekly flows. Every vertex of the domain is investigated for optimality. The problem of the determination of the statistical distribution of an optimal random variable, apparently overlooked by researchers, is a fundamental one in the effective use of optimization in the solution of water resources problems where uncertainty and randomness are rules rather than exceptions. (See also W77-10439) (Bell-Cornell)
W78-04487

APPLICATION OF STATISTICAL DECISION THEORY,
Arizona Univ., Tucson.
L. Duckstein, and D. R. Davis.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 11, p 11-1--11-52, 1976. 3 fig, 2 tab, 74 ref.

Descriptors: *Water resources, *Statistical decision theory, *Risks, *Bayesian decision theory, *Design, *Hydrology, *Stochastic processes, *Economics, Rainfall, Mathematical models, Equations, Systems analysis, Methodology, Probability, Seasonal, Flow, Flood control, Poisson model, Optimization, Benefit maximization, Sensitivity analysis, Hydrologic data, Simulation analysis.

Hydrologic design decisions are often made under various types of uncertainties; as a result, non-optimal decisions may result, with corresponding social and economic losses. The reduction of uncertainties may thus be an important task in the analysis of water resources systems. This chapter considers principally hydrologic and economic uncertainties which are only a part of the whole set of uncertainties present in water resources systems analysis. There are at least three kinds of hydrologic uncertainties present in design problems: (1) natural uncertainty as to rainfall, streamflow, etc.; (2) model uncertainty in that the models may not represent the true processes; and (3) parameter or sample uncertainty when the estimated parameters from historical data are not true population values. Examples of uncertainty in estimating hydrologic parameters and in design decisions are given. Parameter estimation for return periods of extreme events, rainfall and seasonal flow volumes are discussed. Decision making under natural as well as sample, uncertainty (Bayesian Decision Theory), trade-off between uncertainties, system design methodology, and an iterative process between models, decision, and data are also considered. (See also W77-10439) (Bell-Cornell)
W78-04488

PARAMETER REGIONALIZATION AND NETWORK DESIGN,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
S. I. Solomon.

In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 12, p 12-12-37, 1976. 9 fig, 1 tab, 26 ref, 3 append.

Descriptors: *Parametric hydrology, *Regionalization, *Networks, *Design, *Information transfer, *Stochastic processes, Runoff, Optimization, Cost minimization, Ontario(Canada), Floods, Cost function, Planning, Data bank, Physiographic characteristics, Equations, Mathematical models, Operations research.

Parameter regionalization can be used in hydrology for information transfer and network planning. Basic to parameter regionalization in hydrology is the subdivision of an area into natural regime and modified regime regions. The models used for regionalization in the two regions are of different natures. Model-homogeneous regions can be delineated by applying a selected model to a given region and examining the model errors from the viewpoint of their probability distribution and space-serial independence. Physiographic-homogeneous regions can be delineated by determining the physiographic characteristics which are significant for estimating the parameters of models of various hydrologic characteristics and delineating areas within which these physiographic characteristics vary within narrow limits. Model-homogeneous regionalization can be used to determine the best available model for information transfer and the parameter of error of space sampling required for network optimization. Natural regime network planning optimization can be accomplished by accepting a network planning objective related to data accuracy and constraints related to time, budget, physical resources, etc., by considering the 'whitened' errors of various sources as independent. Coordinated network planning is a most difficult task, but its economic rewards are probably so large that the solution of this task should be attempted in every country as soon as possible. (See also W77-10439) (Bell-Cornell)
W78-04489

WORTH OF DATA,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
S. I. Solomon.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 13, p 13-1--13-30, 1976. 9 fig, 3 tab, 22 ref.

Descriptors: *Economic worth, *Hydrometric data, *Dynamic programming, *Networks, *Stochastic processes, Planning, Sensitivity analysis, Estimating, Methodology, Optimization, Operating costs, Cost minimization, Equations, Mathematical models, Systems analysis.

Dynamic programming is shown to represent a valuable technique for planning the hydrometric network in areas with natural regime for which economic development is being planned; the technique can also be applied where no development is planned, if one can define an accuracy objective or if a budget allocation is given. A dynamic programming technique is applied to conditions in Canada; indicated are high benefit/cost ratios from investments in the hydrometric network. These ratios range from 300 percent if a period of 5 years only is considered to 700 percent if a period of 15 years is considered. High benefit/cost ratios (over 100%) are obtained from the network even under the most conservative assumptions regarding network expansion and operation costs, and other factors. The factor having the largest influence on the network planning decision variables is the rel..tionship between errors in estimating hydrologic characteristics and losses in investment and operation of projects affected by those characteristics. In an economy affected by cyclic development, it is incorrect to reduce investment in the hydrometric network during the recession phase. (See also W77-10439) (Bell-Cornell)
W78-04490

SALINITY MANAGEMENT STRATEGIES FOR THE LOWER SAN LUIS REY RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04499

6B. Evaluation Process

MAR DEL PLATA IN RETROSPECT,
Biswas and Associates, Ottawa (Ontario).
For primary bibliographic entry see Field 6E.
W78-04306

ATTITUDES, CHARACTERISTICS, AND EDUCATION OF WATER RESOURCES PLANNERS AND MANAGERS RELATIVE TO EFFECTIVE PUBLIC PARTICIPATION,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
B. C. Dysart, III, J. J. Fletcher, S. T. Sutterfield, and C. H. Langdon, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 045, Price codes: A05 in paper copy, A01 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No 68, June 1977. 72 p, 11 tab, 4 append. OWRT B-081-SC(2).

Descriptors: *Public participation, *Planning, *Education, *Attitudes, *Surveys, Organizations, Social aspects, Water management(Applied), Water resources development, Decision making, Social participation, Southeast US, Personnel, South Atlantic-Gulf-Tennessee region.

Education, both formal and experience-related, of water resources planners and managers, in both the public and private sectors, is discussed as it pertains to their capabilities to conceive and implement public participation programs. The research is specifically oriented to the South Atlantic-Gulf-Tennessee region, although the resulting insights into water resources planners and managers are probably of much more general applicability. Approximately 300 individuals in the eight states investigated were identified as being actively involved in the water resources planning and management areas. From these, 170 individuals were selected and questioned, using mail questionnaires, as to the extent, orientation, depth, breadth, and currency of their formal and informal education, training and experience in water resources planning and management in general and especially as it related to public involvement. The individuals surveyed represented federal and state agencies, industry and the business community in general, academic and research-oriented persons, and public interest groups. A general conclusion from this analysis is that the greatest interest in some sort of meaningful public participation training program is to be found among engineers in the business and industrial community. The level of interest was also fairly high among non-engineers in business and industry and federal agency engineers. The least interest was consistently demonstrated by the engineers employed by state agencies.
W78-04498

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 3E.
W78-04657

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COSTS AND PRODUCTIVITY IN HARVESTING OF AQUATIC PLANTS,
Wisconsin Univ.-Madison. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-04338

APPLICATIONS FOR SOUTH CAROLINA'S WETLANDS OF A GENERAL MODEL OF EFFICIENT SOLUTIONS TO EXTERNALITIES,
Clemson Univ., SC. Dept. of Economics.
M. T. Maloney, R. T. Byrns, and T. B. Yandle, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 705, Price codes: A08 in paper copy, A01 in microfiche. Water Resources Research Institute, Clemson University, Report No. 70, September 1977. 150 p, 20 fig, 2 tab, 44 ref. OWRT A-036-SC(1).

Descriptors: *Economic planning, *Externalities, *Shellfishing, *Marshlands, Institutions, *Wetlands, *Model studies, Commercial fishing, Commercial shellfish, Shrimp, *South Carolina coastlands, Shellfish farming.

A general model for all externality problems is based on a two-fold dichotomous classification scheme: public/private and large number/small number externalities. From this taxonomy a Pareto welfare model is built with constraints embodying the various types of externalities. The necessary conditions are derived for the various cases of externality problems. Theoretical policy choices are examined for those cases where government intervention is necessary; the market forces that cause bargaining to internalize the externality are shown for the Coasian case. The model is applied to he South Carolina marshland situation with a number of interesting results. First, if externalities exist between the various types of commercial wildlife, they will be internalized if the lands are competitively leased. The leasees should be allowed to engage in all fishing activities with the possible exception of shrimping. Second, if there are externalities between commercial shellfishing in the marsh and shrimping along the coast, a tax should be levied on the shrimpers and paid to the marsh leaseholders. This tax should be based on the number of shrimp leaving the estuary and should be increased so long as the quality of shrimp increases.
W78-04368

CONTROL TARGETS FOR THE MANAGEMENT OF BIOLOGICAL SYSTEMS,
Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
For primary bibliographic entry see Field 6A.
W78-04477

6D. Water Demand

THE 1977 IRRIGATION SURVEY.
For primary bibliographic entry see Field 3F.
W78-04294

STRUCTURE OF WATER USE TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04483

6E. Water Law and Institutions

MAR DEL PLATA IN RETROSPECT,
Biswas and Associates, Ottawa (Ontario).
M. R. Biswas.

Water International, Vol. 2, No. 3, p 15-18+, September, 1977. 4 ref.

Descriptors: *Water resources development, *Conferences, United Nations, Developing countries, Water supply, Potable water, Environmental sanitation, Water utilization, Economics, Water pollution, Planning.

The United Nations Water Conference convened at Mar del Plata, Argentina, in March of 1977, and was attended by 116 governments and many non-government organizations. The work and recommendations of preceding UN conferences, notably those on Environment, Population, Food, and Human Settlements, contributed to the Water Conference. According to resolutions of the Economic and Social Council, the purposes of the conference were to: (1) exchange experiences on water resources development and uses; (2) review new technologies; (3) stimulate greater cooperation; (4) discuss comprehensively the problems of increasing water demand in areas of fixed supply, and; (5) consider specific economic and administrative aspects of water resources planning and development, primarily with respect to policymakers. Some 215 thematic papers were prepared by individual countries for the Conference. The period 1980-1990 was designated the International Drinking Water Supply to Sanitation Decade as a focal point of unanimous agreement on recommendations to provide clean water supplies for all by the end of that period. (Eberle-NWWA)
W78-04306

DETERMINATION OF FEDERAL WATER RIGHTS PURSUANT TO THE MCCARRAN AMENDMENT: GENERAL ADJUDICATIONS IN WYOMING,
Wyoming Univ., Laramie. Coll. of Law.
W. M. Kleppinger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 972, Price codes: A03 in paper copy, A01 in microfiche. Land and Water Review, Vol. 12, No. 2, p. 457-484 (1977). OWRT A-023-WYO(2), 14-34-0001-7108.

Descriptors: *Water law, *Water rights, *Wyoming, State jurisdiction, *Federal-State Water Rights Conflicts, *McCarran Amendment, Federal jurisdiction.

The McCarran Amendment was enacted by Congress in 1952. The Amendment allows the United States to be joined in a state water right adjudication thereby quantifying and coordinating the federal water claim with state water rights. In 1977, the Wyoming Legislature enacted a bill designed to permit general adjudication of all water claims within the state, including federal claims asserted under the reserved rights doctrine. The Legislature's intent was to construct the bill in such a manner that the waiver of sovereign immunity provisions of the McCarran Amendment could be taken advantage of. The reserved rights doctrine and the McCarran Amendment are discussed, especially in terms of the conditions a state must comply with in order to fall within the McCarran Amendment's waiver of sovereign immunity. An analysis is made of the new Wyoming general adjudication statute and it is discussed in light of the hurdles a statute must overcome to be within the McCarran Amendment requirements so the sovereign immunity of the United States is waived, i.e., due process, judicial proceedings, general adjudication. The Wyoming Statute may have left open an avenue of federal challenge in regard to whether the statute provides a truly general, non-private proceeding for water rights adjudication, however, the Wyoming Statute can withstand federal challenge because of its similarity to the accepted Colorado system and because the Wyoming system is harmonious with the McCarran Amendment policies.
W78-04369

CONTROLLING THE ENTRANCE OF TOXIC POLLUTANTS INTO U.S. WATERS,
Department of Commerce, Washington, DC. Office of Environmental Affairs.
For primary bibliographic entry see Field 5G.
W78-04389

SEWERAGE COSTS RISING AT A FASTER PACE.
For primary bibliographic entry see Field 5G.
W78-04644

6G. Ecologic Impact Of Water Development

GLOBAL DISTRIBUTION OF CARCINOGENIC POLLUTANTS IN WATER,
National Cancer Inst., Bethesda, MD.
For primary bibliographic entry see Field 5B.
W78-04304

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO. 4, THE PRODUCTION, USE AND DISTRIBUTION OF PHTHALIC ACID ESTERS IN CANADA,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-04348

WATER QUALITY AT FIVE PROPOSED INDUSTRIAL SITES ON THE ROANOKE AND NEW RIVERS,
Nuclear Regulatory Commission, Washington, DC. Office of Nuclear Reactor Regulation.
For primary bibliographic entry see Field 5C.
W78-04497

STATE-OF-THE-ART SURVEY AND EVALUATION OF OPEN-WATER DREDGED MATERIAL PLACEMENT METHODOLOGY,
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-04533

DREDGED MATERIAL RESEARCH PROGRAM, THIRD ANNUAL REPORT.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W78-04534

GROWTH RESPONSES OF COASTAL HALOPHYTES TO INORGANIC NITROGEN,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-04542

THE VEGETATION OF SALT MARSHES AT SOME COASTAL SITES IN ARCTIC NORTH AMERICA,
Toronto Univ. (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 2L.
W78-04543

PALEOECOLOGICAL ASPECTS OF THE RED LAKE PEATLAND, NORTHERN MINNESOTA,
Oslo Univ. (Norwich). Inst. of Geology.
For primary bibliographic entry see Field 2H.
W78-04544

REMOTE SENSOR IMAGERY ANALYSIS FOR ENVIRONMENTAL IMPACT ASSESSMENT,
Army Engineer Topographic Labs., Fort Belvoir, VA. Geographic Sciences Lab.
For primary bibliographic entry see Field 5A.
W78-04692

A SEARCH FOR ENVIRONMENTAL PROBLEMS OF THE FUTURE,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5A.
W78-04696

7. RESOURCES DATA

7A. Network Design

PARAMETER REGIONALIZATION AND NETWORK DESIGN,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04489

WORTH OF DATA,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04490

A SEARCH FOR ENVIRONMENTAL PROBLEMS OF THE FUTURE,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5A.
W78-04696

7B. Data Acquisition

SNOTEL: MONITORING CLIMATIC FACTORS TO PREDICT WATER SUPPLIES,
Soil Conservation Service, Portland, OR. West Technical Service Center.
A. G. Crook.
Journal of Soil and Water Conservation, Vol. 32, No. 6, p 294-295, November-December 1977. 2 fig, 5 ref.

Descriptors: *Snowpacks, *Monitoring, *Telemetry, Surveys, Snow, Mountains, Water resources, *Water supply, Remote sensing, Measurement, Snowmelt, Runoff, Forecasting, Snow management, *Instrumentation, *Western US, Snowpack telemetry, Meteor burst telemetry, Telemetry systems.

A new program, SNOTEL, is being implemented in the West to provide water managers with information that should help them make more efficient use of existing water supplies. In May 1976, the Government Services Division of Western Union began development of a data communications system using the meteor burst concept. The first phase of the project consists of 2 master stations and 160 remote data sites in 11 western states. A typical remote site has sensors that measure the water equivalent of the snowpack, rainfall, and air temperature. The central computer automatically instructs the base stations to poll remote sites at the desired frequency. With the SNOTEL system, which provides snow resource data almost instantaneously, forecasters should be able to determine more accurately the volume and distribution of the next summer's snowmelt runoff. (Sims-ISWS)
W78-04213

APPLICATIONS OF REMOTE SENSING TECHNIQUES TO COUNTY LAND USE AND FLOOD HAZARD MAPPING,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7C.
W78-04215

UTILITY OF A SCANNING DENSITOMETER IN ANALYZING REMOTELY SENSED IMAGERY,
National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.

J. T. Dooley.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-16415, Price codes: A02 in paper copy, A01 in microfiche. NASA Technical Memorandum X-73533, December 1976. 19 p, 9 fig, 2 tab, 9 ref.

Descriptors: *Remote sensing, *Data processing, Equipment, *Instrumentation, Analytical techniques, Photography, Aerial photography, Satellites(Artificial), Land use, Water quality, Strip mines, *Scanning densitometers.

The utility of a scanning densitometer for analyzing imagery in the NASA Lewis Research Center's regional remote sensing program was evaluated. Uses studied included: (1) quick-look screening of imagery by means of density slicing, magnification, color coding, and edge enhancement; (2) preliminary category classification of both low- and high-resolution data bases; and (3) quantitative measurement of the extent of features within selected areas. The densitometer was capable of providing fast, convenient, and relatively inexpensive preliminary analysis of aerial and satellite photography and scanner imagery involving land cover, water quality, strip mining, and energy conservation. (Sims-ISWS)
W78-04220

GROUNDED ICE IN THE FAST ICE ZONE ALONG THE BEAUFORT SEA COAST OF ALASKA,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-04224

WINTER THERMAL STRUCTURE AND ICE CONDITIONS ON LAKE CHAMPLAIN, VERMONT,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W78-04227

AN ERTS-1 INVESTIGATION FOR LAKE ONTARIO AND ITS BASIN,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 2H.
W78-04230

APPLICATION OF REMOTE SENSING IN THE DETERMINATION OF WATER QUALITY IN NEBRASKA RESERVOIRS,
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 5A.
W78-04231

REMOTE SENSING OF ACCUMULATED FRAZIL AND BRASH ICE IN THE ST. LAWRENCE RIVER,
Army Terrestrial Sciences Center, Hanover, NH. Applied Research Branch.
For primary bibliographic entry see Field 2C.
W78-04234

NEWER TECHNIQUES AID SEARCH FOR GROUND WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
W. L. Anderson.
Johnson Drillers Journal, Vol 49, No 6, p 2-4, November-December, 1977. 2 fig.

Descriptors: *Electrical studies, *Resistivity, Groundwater, Exploration, Porosity, Permeability, Dissolved solids, Sediments, Aquifers, Electrical conductance.

Because test-hole drilling at random has become far too expensive as a ground water prospecting technique, surface geophysical methods such as electrical resistivity profiling are seeing increased use. Knowing the relative resistance value of subsurface materials, it is possible for a geologist or driller to select a prime location for exploratory drilling by passing curent rhgough two outer electrodes and measuring the voltage drop between two interior electrodes. The degree to which unconsolidated sediments and bedrock conduct electrical current depends on three factors: the amount of void space between particles (porosity), the permeability of the material, and the conductivity of the fluid contained in pore spaces (the greater the TDS, the higher the conductivity value) In general, resistivity decreases with porosity and water volume and as water conductivity increases. These relations provide the basis for distinguishing, in an approximate fashion, variations in subsurface materials. (Eberle-NWWA)
W78-04296

EXPENDABLE OCEANOGRAPHY PROBE,
Matsushita Electric Industrial Co., Ltd., Osaka (Japan). (Assignee).
Y. Kaname, M. Nakajima, and K. Tabuchi.
U.S. Patent No. 4,044,611, 12 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 1986, August 30, 1977.

Descriptors: *Patents, *Sensors, Instruments, *Oceanography, Acoustics, Temperature, Salinity, *Expendable probes(Oceanography).

An improved and completely free-falling oceanography probe which has a cylindrical-shaped housing the fall of which is not restricted by wires or any other mechanical connections is described. It can be thrown from a vessel moving at sea. A simple construction transmits telemetered signals to a vessel with a sound wave carrier in the water. The probe has a transducer holder which has an acoustical cavity for controlling the directional pattern of the sound wave into the surrounding water. A sensor is mounted on the front end to detect information relating to the water to be tested. An electroacoustical disk transducer combined with an oscillating circuit radiates a sound signal into the water. (Sinha - OEIS)
W78-04317

TRACING VERTICAL TRANSLOCATION OF SOIL MOISTURE,
Clemson Univ., SC. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-04332

A RADIOTRACER TECHNIQUE FOR MEASURING SEDIMENT MOVEMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-04344

THE DETERMINATION OF REGIONAL EVAPOTRANSPIRATION BY MEANS OF STANDARD METEOROLOGICAL DATA,
Cornell University Ithaca, New York, School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2D.
W78-04372

NEW HYGIENIC FLOWMETER.
Water and Waste Treatment, Vol 20, No 10, p 52-53, October, 1977.

Descriptors: *Flowmeters, *Flow measurement, Equipment, *Food processing industry, Flow rates, Automation, Monitoring, Industrial water, Industrial wastes, Electronic equipment.

Euromatic Flowmeters Ltd., under the auspices of Euromatic Machine and Oil Company Ltd., has begun marketing the Type S3 flowmeter for use in the dairy, brewery, wine, spirits, food processing, and pharmaceutical industries. The modular design of the flowmeter includes a body and two bearing supports. The bearing supports are held in place by magnetic force and are machined to prevent incorrect assembly. Standard Tri-clover clamps can be used to attach the meter to a pipline. The meter can be attached to an air detection probe or to electronic equipment read-out units. The five models in production can handle a flow range of 3-500 gpm at an accuracy of 0.01% for a 5/1 turndown. The Type S3 flowmeter is reported to have a linearity of 0.15%, repeatiblity of 0.02%, and bi-directional correlation of 0.2%. (Schulz-FIRL)
W78-04392

HYDROGEOLOGY AND DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN NORTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-04496

ICEBERG SOUNDING BY IMPULSE RADAR,
Memorial Univ. of Newfoundland, St. John's. Centre for Cold Ocean Resources Engineering.
For primary bibliographic entry see Field 2C.
W78-04516

THE SMALL SAMPLE ESTIMATION OF H,
Technical Univ. of Istanbul. (Turkey). Dept. of Hydraulics and Water Power.
For primary bibliographic entry see Field 2E.
W78-04526

PATH- AND AREA-INTEGRATED RAINFALL MEASUREMENT BY MICROWAVE ATTENUATION IN THE 1-3 CM BAND,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2B.
W78-04530

MEASUREMENT TECHNIQUES FOR COASTAL WAVES AND CURRENTS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-04532

THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 2L.
W78-04536

MODEL DDO/MARK V DIGITAL DISSOLVED OXYGEN ANALYZER.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04547

BECKMAN FIELDLAB DISSOLVED OXYGEN SYSTEM.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04548

DISSOLVED OXYGEN ANALYZER MODEL 330.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04549

THERMOCOUPLE READOUT INSTRUMENT,
Robert S. Kerr Environmental Research Lab., Ada, OK.
C. G. Enfield, and C. V. Gillaspy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 420, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/2-77-220, November 1977. 14 p, 3 fig, 2 tab, 7 ref. 1BC611.

Descriptors: *Instrumentation, Temperature, Thermal properties, Sampling, *Electrical equipment, *Thermocouples, Ice bath, Circuit diagrams.

An electronic circuit, which acts as an electronic ice bath for chromel-constantan thermocouples has been developed. The electronic ice bath is accurate to within + or - 0.2 degree Centigrade from -25 degrees Centigrade to + 50 degrees Centigrade. Simultaneously, the thermocouple output is scaled and linearized such that the temperature can be read directly in degrees Centigrade with a sensitivity of 100 mV/degree Centigrade with 0 VDC at 0 degree Centigrade. Circuit diagrams and construction considerations are furnished. A temperature readout instrument can be constructed for use in remote locations where a supply of ice is not readily available for use as a reference temperature. (Wares-IPA).
W78-04678

AERIAL AIR POLLUTION SENSING TECHNIQUES,
Environmental Protection Agency, Las Vegas, NV. Monitoring Operations Lab.
For primary bibliographic entry see Field 5A.
W78-04680

REMOTE DETECTION OF WATER POLLUTION WITH MOCS: AN IMAGINING MULTISPECTRAL SCANNER,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04681

THE USE OF NEAR-INFRARED REFLECTED SUNLIGHT FOR BIODEGRADABLE POLLUTION MONITORING,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04682

ST. LOUIS REGIONAL AIR MONITORING SYSTEM,
National Environmental Research Center, Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W78-04683

LONG PATH OPTICAL MEASUREMENT OF ATMOSPHERIC POLLUTANTS,
Health Effects Research Lab., Research Triangle Park, NC. Chemistry and Physics Lab.
For primary bibliographic entry see Field 5A.
W78-04684

A REVIEW OF AVAILABLE TECHNIQUES FOR COUPLING CONTINUOUS GASEOUS POLLUTANT MONITORS TO EMISSION SOURCES,
Health Effects Research Lab., Research Triangle Park, NC. Chemistry and Physics Lab.
For primary bibliographic entry see Field 5A.
W78-04685

INSITU SENSOR SYSTEMS FOR WATER QUALITY MEASUREMENT,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5A.
W78-04686

A REGIONAL WATER QUALITY MONITORING SYSTEM,
Minneapolis Metropolitan Sewer Board of the Twin Cities Area, Md.
For primary bibliographic entry see Field 5A.
W78-04687

WATER QUALITY MONITORING IN SOME EASTERN EUROPEAN COUNTRIES,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5A.
W78-04688

AN AIRBORNE LASER FLUOROSENSOR FOR THE DETECTION OF OIL ON WATER,
National Aeronautics and Space Administration, Wallops Island, VA. Wallops Station.
For primary bibliographic entry see Field 5A.
W78-04689

REMOTE SENSING DATA, A BASIS FOR MONITORING SYSTEMS DESIGN,
Geological Survey, Iowa City, IA.
For primary bibliographic entry see Field 5A.
W78-04690

TECHNIQUES AND PROCEDURES FOR QUANTITATIVE WATER SURFACE TEMPERATURE SURVEYS USING AIRBORNE SENSORS,
National Aeronautics and Space Administration, Bay Saint Louis, MS. Earth Resources Lab.
For primary bibliographic entry see Field 5A.
W78-04691

REMOTE SENSOR IMAGERY ANALYSIS FOR ENVIRONMENTAL IMPACT ASSESSMENT,
Army Engineer Topographic Labs., Fort Belvoir, VA. Geographic Sciences Lab.
For primary bibliographic entry see Field 5A.
W78-04692

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUBOPTIMUM WEATHER,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04693

ENVIRONMENTAL APPLICATION OF THE EARTH RESOURCES TECHNOLOGY SATELLITE,
General Electric Co., Beltsville, MD. Space Div.
For primary bibliographic entry see Field 5A.
W78-04694

AIRCRAFT AND SATELLITE MONITORING OF LAKE SUPERIOR POLLUTION SOURCES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-04695

SENSOR UTILIZATION IN NEW ENGLAND,
Environmental Protection Agency, Boston, MA. Region I.
For primary bibliographic entry see Field 5A.
W78-04697

ENVIRONMENTAL MONITORING NEEDS IN REGION V,
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5A.
W78-04698

COMMENTS ON ENVIRONMENTAL MONITORING IN REGION VII AND SOME MONITORING PLANS AND NEEDS PREPARED FOR SECOND CONFERENCE ON ENVIRONMENTAL SENSORS,
Environmental Protection Agency, Kansas City, MO. Region VII.
For primary bibliographic entry see Field 5A.
W78-04699

7C. Evaluation, Processing and Publication

APPLICATIONS OF REMOTE SENSING TECHNIQUES TO COUNTY LAND USE AND FLOOD HAZARD MAPPING,
Arizona Univ., Tucson. Office of Arid Lands Studies.
R. B. Clark, J. S. Conn, D. A. Miller, and D. A. Mouat.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-32617, Price codes: A03 in paper copy, A01 in microfiche. OALS Bulletin 12, November 1975. 36 p, 12 fig, 2 tab, 11 ref. NASA NGL 03-002-313.

Descriptors: *Remote sensing, *Flood plains, *Flood plain zoning, *Arizona, Satellites(Artificial), Aerial photography, Flood plain insurance, Land use, Soils, Vegetation, Geomorphology, Rivers, Arid lands, Data processing, Analytical techniques, Floods, Erosion, Hydrology, *LANDSAT.

Local governmental planning agencies traditionally have regulated the design of new subdivisions by adoption of local regulations which sometimes require (among other considerations) minimum drainage design criteria. Due to passage of the mandatory floodplain regulations at the state level, local planning agencies now are faced with the task of the delineation of floodplains. Remote sensing systems offer a dynamic resource inventory system which can be used to complement traditional detailed studies or can serve as an important source of information in regions where detailed studies are not available. In Graham, Yuma, Yavapai, and Apache Counties, Arizona, remote sensing techniques have provided hydrologic information in areas where planning had been hampered by the lack of suitable hydrologic data. The County Planning Departments now can guide development more wisely away from flood prone areas, even with only limited funds and manpower. (Sims-ISWS)
W78-04215

PRECIPITABLE WATER OVER THE UNITED STATES, VOLUME 1: MONTHLY MEANS,
National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W78-04218

DIGITAL FLOW MODEL OF THE CHOWAN RIVER ESTUARY, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 2L.
W78-04250

A DIGITAL MODEL OF THE FLORIDAN AQUIFER, NORTH OF TAMPA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-04251

GROUND-WATER BASIC DATA FOR MORTON COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
D. J. Ackerman.

North Dakota County Ground-Water Studies 27--Part II, and North Dakota Geological Survey Bulletin 72--Part II, Bismarck, 1977. 592 p, 2 fig, 1 plate, 6 tab, 10 ref.

Descriptors: *Groundwater, *Basic data collections, *North Dakota, *Aquifer characteristics, *Water quality, Water supply, Groundwater availability, Hydrogeology, Water wells, Groundwater recharge, Well data, Water yield, Potential water supply, Observation wells, Water levels, Water users, Chemical analysis, Morton County(N Dak).

The purpose of this ground-water investigation in Morton County, N. Dak., was to determine the quantity and quality of ground water available for municipal, domestic, livestock, industrial, and irrigation uses. Specifically, the objectives were: (1) determine the location, extent, and nature of the major aquifers; (2) evaluate the occurrence and movement of ground water, including the sources of recharge and discharge; (3) estimate the quantities of water stored in the aquifers; (4) estimate the potential yields to wells tapping the aquifers; and (5) determine the chemical quality of the ground water. Most data in this report were collected between 1972 and 1975. All data-collection points are shown. The data consist of the following: (1) Geologic and hydrologic data for 1,209 wells, test holes, and springs; (2) water-level measurements for 148 observation wells; (3) lithologic and geophysical logs for 247 test holes and wells; (4) chemical analyses of 353 water samples; and (5) analyses of physical properties of 42 core samples. (Woodard-USGS)
W78-04252

GROUND-WATER LEVELS IN THE UNITED STATES, 1973-74. NORTHEASTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04255

GEOHYDROLOGY OF NORTH EASTERN PROVINCE, KENYA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04256

SUMMARY OF BASIC HYDROLOGIC DATA COLLECTED AT COSO HOT SPRINGS, INYO COUNTY, CALIFORNIA,
Geological Survey, Luguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04258

APPROXIMATE AREAS OF RECHARGE TO THE CHICOT AND EVANGELINE AQUIFER SYSTEM IN THE HOUSTON-GALVESTON AREA, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
R. K. Gabrysch.
Open-file report 77-754, November 1977. 1 sheet, 11 ref.

Descriptors: *Groundwater recharge, *Natural recharge, *Aquifers, *Texas, *Maps, *Houston-Galveston area(Tex), *Evangeline aquifer(Tex), *Chicot aquifer(Tex).

This map shows the general geographic areas of recharge to the Chicot and Evangeline aquifers in the Houston area, Texas. The area of recharge for the Evangeline an Chicot aquifers is between the outcrop of the Beaumont Clay and the updip part of the Fleming Formation. The recharge area for the Evangeline aquifer includes the most landward outcrop of the Willis Formation and in places, the coastward outcrop of the Fleming Formation. The recharge area of the Chicot aquifer includes the outcrops of the Montgomery and Bentley Formations and coastward outcrop of the Willis Formation. (Woodard-USGS)
W78-04264

WATER-LEVEL CHANGES IN THE NORTHERN HIGH PLAINS OF COLORADO, 1964 TO 1976 AND 1972 TO 1976,
Geological Survey, Lakewood, CO. Water Resources Div.
R. G. Borman, and T. J. Major.
Water-Resources Investigations 77-42 (open-file report), November 1977. 1 sheet, 8 ref.

Descriptors: *Groundwater resources, *Groundwater mining, *Water level fluctuations, *Maps, *Aquifers, Colorado, Pumping, Water supply, Irrigation, Hydrogeology, Hydrologic data, *Northern High Plains(Colo), Ogallala Formation.

The northern High Plains of Colorado, an area of 9,500 square miles (24,600 square kilometers) in the eastern part of the State, is underlain by the Ogallala Formation. Water levels in the Ogallala Formation, the major aquifer in the area, have been declining in areas of ground-water pumping for irrigation. Knowledge of the amount and extent of these declines is necessary for management of the ground-water resource. Water levels have declined as much as 32-40 feet (9.8-12 meters) in an area near Burlington, Kit Carson County, from 1964 to 1976. Maximum declines of 24-32 feet (7.3-9.8 meters) have occurred near the Kiowa-Prowers County line and in a small area northeast of Burlington from 1972 to 1976. Water levels in much of the rest of the area affected by irrigation pumping have declined less than 16 feet (4.9 meters) from 1964 to 1976 and less than 8 feet (2.4 meters) from 1972 to 1976. Water levels have been declining more rapidly in recent years, especially since 1974. (Woodard-USGS)
W78-04265

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
Water-Data Report CA-76-1, December 1977. 632 p, 6 fig, 1 tab.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Colorado River basin, Great Basin, Southern Great Basin(Mexican border to Mono Lake Basin), *Pacific Slope basins(Tijuana River to Santa Maria River).

Volume 1 of water resources data for the 1976 water year for California consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 243 gaging stations, stage-only record for 1 gaging station, stage and contents for 19 lakes and reservoirs, water quality for 60 stations and 2 wells, and water levels for 22 observation wells. Also included are 22 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W78-04266

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE.
Geological Survey, Menlo Park, CA. Water Resources Div.
Water-Data Report CA-76-4, December 1977. 389 p, 12 fig, 1 tab.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Northwest California, Northern Central Valley basins, The Great Basin.

Volume 4 of the water resources data for the 1976 water year for California consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 197 gaging stations, stage and contents for 31 lakes and reservoirs, water quality for 38 stations, and water levels for 3 observation wells. Also included are 25 crest-stage partial-record stations, 15 low-flow partial-record stations, and 7 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W78-04267

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 354, Price codes: A18 in paper copy, A01 in microfiche.
Water-Data Report CA-76-3, December 1977. 397 p, 12 fig, 1 tab.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Central California.

Volume 3 of water resources data for the 1976 water year for California consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 180 gaging stations, stage and contents for 42 lakes and reservoirs, water quality for 44 stations and 1 well, and water levels for 14 observation wells. Also included are 33 crest-stage partial-record stations, 25 low-flow partial-record stations, and 8 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W78-04268

COMPUTER AIDS DESIGN OF PRESSURE STORAGE TANKS,
For primary bibliographic entry see Field 8C.
W78-04298

STORAGE FOR STORM WATER QUALITY CONTROL - MEADOWVALE TEST SITE STUDY,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04357

THE ALL-PURPOSE MATHEMATICAL MODEL,
New York State Dept. of Environmental Conservation, Albany. Div. of Pure Waters.
For primary bibliographic entry see Field 6A.
W78-04478

CHARACTERISTICS OF THE SOLUTION ALGORITHMS FOR THE QUAL II RIVER MODEL,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5B.
W78-04479

AN EVALUATION OF A COMPUTER SIMULATION MODEL OF PLANKTON DYNAMICS IN MONTEREY BAY,
Naval Postgraduate School, Monterey, CA.
For primary bibliographic entry see Field 5C.
W78-04480

GENERAL OVERVIEW OF APPLICATION OF STOCHASTIC METHODS TO WATER RESOURCES PROBLEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04482

APPLICATION OF STOCHASTIC METHODS IN WATER RESOURCES STUDIES,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W78-04484

WORTH OF DATA,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04490

RIVER BASIN WATER QUALITY SAMPLING,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04491

COASTAL WETLANDS ALONG LAKE ONTARIO AND THE ST. LAWRENCE RIVER IN JEFFERSON COUNTY, NEW YORK,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 2H.
W78-04546

INTERACTIVE COMPUTER DESIGN OF WASTEWATER PLANTS,
Herkenhoff (Grodon) and Associates, Inc., Albuquerque, NM.
T. E. Shoemaker, and W. A. Barkley.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE5, p 919-934, October, 1977. 1 fig, 10 ref, 1 append.

Descriptors: *Design criteria, *Computer models, *Mathematical models, *Model studies, *Water quality standards, *Treatment facilities, Network design, Waste water treatment.

Increased interest in higher level, more costly waste water treatment facilities has led to the need for more effective design practices. A variety of mathematical models have been developed to aid in treatment plant design. The two basic design approaches involve either effluent criteria and unit sizes or are directed toward upgrading existing facilities. Standard values and indices have been used in many models. Since treatment streams are often recycled to process units, programs have been developed to analyze and minimize recycling requirements. The use of low diagrams, stream parameters, and unit operation parameters is discussed with respect to unit process ordering and input requirements. A design example involving the addition of an activated sludge unit to an existing trickling filter plant is used to illustrate input parameters, computer output, and final sizes of the unit processes which have been calculated by an interactive computer program for waste water treatment plant design. (Schulz-FIRL)
W78-04626

A MODEL FOR THE SIMULATION OF RAINWATER RUNOFF IN SEWERS (EIN MODELL ZUR SIMULATION DES REGENABFLUSSES IN KANALISATIONSNETZEN),
Balzari Blaser Schudel, Ingenieure und Planer, Bern (Switzerland).
For primary bibliographic entry see Field 5B.
W78-04627

8. ENGINEERING WORKS

8B. Hydraulics

HYDROLOGIC CONSIDERATIONS OF THE UPPER ST. JOHNS RIVER BASIN, FLORIDA,
Florida State Dept. of Environmental Regulation, Tallahassee.
For primary bibliographic entry see Field 2E.
W78-04204

WAVE PERIOD EFFECT ON THE STABILITY OF RIPRAP,
Coastal Engineering Research Center, Fort Belvoir, VA.
J. P. Ahrens, and B. L. McCartney.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 726, Price codes: A02 in paper copy, A01 in microfiche. CERC Reprint R 76-2, June 1975. Reprinted by the American Society of Civil Engineers from the Proc of the Specialty Conference on 'Civil Engineering in the Oceans/III' held June 9-12, 1975 at the Univ of Del, Newark. p 1019-1034, 6 fig, 3 tab, 9 ref.

Descriptors: *Riprap, *Bank stabilization, *Laboratory tests, Waves(Water), Bank protection, Shore protection, Model studies, Data processing, Erosion control, Structures, Rocks, Slopes, Shores, Engineering, Coastal engineering, *Riprap stability.

Test data on the stability of dumped quarry stone riprap to wave attack were presented and analyzed. The tests were conducted in the large two-dimensional wave tank at the Coastal Engineering Research Center (CERC) at near prototype scale. The test data showed riprap stability changes with wave period with the lowest stability occurring at a period that creates a collapsing breaker. Methods to predict riprap stability and wave runup on riprap were developed and discussed. (Sims-ISWS)
W78-04214

DESIGN WAVE INFORMATION FOR THE GREAT LAKES, REPORT 3, LAKE MICHIGAN,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
D. T. Resio, and C. L. Vincent.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 029, Price codes: A11 in paper copy, A01 in microfiche. Technical Report H-76-1, November 1976. 229 p, 37 fig, 9 tab, 66 ref, 6 append.

Descriptors: *Waves(Water), *Lake Michigan, *Great Lakes, Winds, Extratropical cyclones, Tropical cyclones, Air circulation, Boundary layers, Wind velocity, Model studies, On-site data collections, Mathematical models, Equations, Regression analysis, Data processing, Lakes, Limnology, *Wave data, *Design waves, Wave models, Wave spectra, Wind-generated waves.

Hindcast wave information was presented that is applicable to many planning and design purposes on Lake Michigan. Historical wind data from six stations along Lake Michigan served as input to the numerical hindcast model, and significant wave heights were calculated for 5-, 10-, 20-, 50-, and 100-yr return periods. The results were provided in tabular form for 64 points along the Lake Michigan shoreline. The mean significant period for each of these wave heights also was given. Information was provided for four seasons of the year (January-March, April-June, July-September, and October-December) and was separated into three approach directions relative to shore. (Sims-ISWS)
W78-04217

WAVE ATTENUATION BY ARTIFICIAL SEAWEED,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-04232

ST. MARYS RIVER ICE BOOMS, DESIGN FORCE ESTIMATE AND FIELD MEASUREMENTS,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-04233

FLOW PATTERN CONTROL BY ENTRAINMENT REGULATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04336

THE SLIDING BED FACIES IN ESKER SANDS AND GRAVELS: A CRITERION FOR FULL-PIPE (TUNNEL) FLOW,
Wilfrid Laurier Univ., Waterloo (Ontario). Dept. of Geography.
H. C. Saunderson.
Sedimentology, Vol. 24, No. 5, p 623-638, October 1977. 7 fig, 2 tab, 37 ref.

Descriptors: *Canada, *Glacial sediments, *Sands, *Gravels, Sedimentation, Tunnels, Sediment transport, Particle size, Graphical analysis, Deltas, *Facies(Sedimentary), *Eskers, Subglacial tunnels, Sliding-bed facies.

The Guelph esker (Ontario) consists of a sinuous, steep-sided, and segmented ridge which comprises poorly sorted, matrix-supported sands, and gravels. These sands and gravels probably were deposited during the sliding bed stage which has been observed by others in closed-conduit hydraulic experiments. The poor sorting probably resulted from a high concentration of bed-material load in the lower part of a subglacial tunnel, sorting being restricted to that produced by particle collisions. Inclusive graphic standard deviation is characteristically large for the sands and gravels, indicating that virtually all sizes available were in transport. The overall grain size distribution shows a characteristic undulatory shape on arithmetic probability paper, mostly because of selective

removal of pebble gravel and granule sizes. This poorly sorted facies is believed to be diagnostic of transport in a subglacial tunnel flowing full of water and may be used to identify subglacial conditions in other eskers. Deltaic sands and gravels occur downcurrent of the esker and contain a greater diversity of structures; climbing-ripple crosslaminae, parallel laminae and massive structure, deposited in large-scale foresets at the end of a subglacial tunnel. These deltaic sands and gravels grade distally into outwash sands and gravels. (Visocky-ISWS)
W78-04504

ACCUMULATION OF SLIME IN DRAINAGE PIPES AND THEIR EFFECT ON FLOW RESISTANCE,
Clay Pipe Development Association Ltd., London (England).
C. E. G. Bland, R. W. Bayley, and E. V. Thomas.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 134-143, January 1978. 4 fig, 8 tab, 10 ref.

Descriptors: *Slime, *Pipes, *Sewers, Flow, Drainage, Drainage water, Sewage, Pipelines, Clay pipes, Plastic pipes, Pipe flow, Roughness(Hydraulic), Hydraulics, Laboratory tests, *Slime accumulation.

Experimental work on the hydraulic roughness of clean new vitrified clay pipes carrying potable water was detailed, and the results for the three types of interior finishes were given. Experimental work to determine the accumulation of microbiological slime on short lengths of drainage pipes of six different materials was discussed, and results of the dry weight accumulation were given. Also described were the experimental apparatus used to determine the hydraulic roughness of vitrified clay and the unplasticized poly-vinyl chloride pipes of 100-mm nominal bore when flowing full. The results of various velocities and duration of test were given. The conclusions showed that the mean hydraulic roughness as expressed as a k value in the Colebrook-White equation for both unplasticized poly-vinyl chloride and vitrified clay are practically the same after the pipes have matured. (Sims-ISWS)
W78-04506

APPLICATION OF THE DRILL-STEM TEST TO HYDROGEOLOGY,
Research Council of Alberta, Edmonton. Groundwater Div.
D. A. Hackbarth.
Ground Water, Vol 16, No 1, p 5-11, January-February 1978. 8 fig, 17 ref.

Descriptors: *Drill holes, *Hydrogeology, *Hydraulic conductivity, *Groundwater, Drilling, Sampling, Drilling samples, Pressure, On-site investigations, Wells, Oil wells, Observation wells, Equipment, Data processing, Groundwater movement, Geology, Hydrology, *Drill-stem tests.

Drill-stem tests may be useful for such hydrogeological purposes as regional groundwater or geothermal resource studies. Water samples, hydraulic head, and hydraulic conductivity may be obtained from the tests. Analysis of 41 drill-stem tests conducted for a regional groundwater study revealed that maximum pressures recorded during a test should exceed 30% of the full scale of the pressure gauge used in the case of bourdon-type instruments. Use of drill-stem test data without consideration of percent deflection of the pressure recorder, even with evaluation of mechanical quality, will mean that individual values of pressure head may be as much as 30% different from that which would be obtained in an observation well. The error is random and has a median value approximating that which would be observed in a well completed over the same interval. Use of large numbers of drill-stem tests well produce hydraulic head maps which agree with those produced by conventional observation wells. (Sims-ISWS)
W78-04508

MINIMUM STREAM POWER FOR RIVERS AND DELTAS,
San Diego State Univ., CA. Dept. of Civil Engineering.
H. H. Chang, and J. C. Hill.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY12, Proceedings Paper 13394, p 1375-1389, December 1977. 11 fig, 12 ref.

Descriptors: *Channels, *Deltas, *Rivers, Erosion, Sediment transport, Open channel flow, Sedimentation, Mathematical models, Numerical analysis, Hydraulics, Fluvial sediment, Aggradation, Alluvial channels, Alluvial fans, Oceans, *Channel alteration, Unsteady stream flow, Delta flow.

A numerical model for channel alterations was developed for sand bed rivers and deltas. The unsteady river flow was computed using the continuity equation and momentum equation of flow with prescribed boundary conditions. Changes in cross sectional area and delta growth were evaluated based upon the continuity equation for sediment and a sediment transport equation. Subject to certain physical constraints, the part of the river on the delta (delta stream) was assumed to adjust its width freely. To determine the variation in delta stream width, it was assumed to vary in such a way that the total stream power of the river flow is a minimum subject to the physical constraints. The analytical results substantiated with field data indicated that the width-depth ratio of the delta stream tends to increase with a decreasing velocity in an aggrading delta stream, while it tends to decrease with an increasing velocity in a degrading delta stream. (Lee-ISWS)
W78-04519

BAFFLED APRON AS SPILLWAY ENERGY DISSIPATOR,
Bureau of Reclamation, Denver, CO. Hydraulics Branch.
T. J. Rhone.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY12, Proceedings Paper 13373, p 1391-1401, December 1977. 17 fig, 3 ref, 1 append.

Descriptors: *Spillways, *Energy dissipation, *Hydraulic models, *Baffles, *Design criteria, Model studies, Laboratory tests, Chutes, Hydraulic structures, Flow, *Aprons, Hydraulics, Pressure head, Water pressure, Discharge(Water), Outlet works, Conveyance structures, Energy gradient.

Hydraulic model investigations were performed to determine basic design criteria for a baffled apron spillway as an energy dissipator. Described were the effects of baffle block heights and spacing of the hydraulic efficiency of the system. Impact pressures were measured on the upstream faces of the blocks to determine impact forces. Pressures on the side, top, and back of the blocks also were measured to determine the possibility of cavitation damage. Special consideration was given to develop alternative entrances to the baffled spillway. Three entrance configurations were proposed, two of which will not increase the upstream water level. The third entrance is similar to the conventional type used in contemporary designs. Typical design procedures were outlined. Included were the detemination of ideal design discharge criteria which might be less than the expected maximum and suggestions on how to modify the structure to handle discharges greater than the design. These studies indicated that this type of structure was satisfactory for any discharge, but structural and size-of-block limitations might control the quantity of the design unit discharge. Model tests of specific projects showed that the concept could be used in lieu of spillway energy dissipators at larger unit discharges. As with all new concepts, a design based on this example should be confirmed by hydraulic model studies. (Humphreys-ISWS)
W78-04520

DESIGN CHART FOR PREDICTING CRITICAL POINT ON SPILLWAYS,
Ministry of Works and Development, Lower Hutt (New Zealand). Central Lab.
R. J. Keller, and A. K. Rastogi.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 103, No HY12, Proceedings Paper 13426, p 1417-1429, December 1977. 5 fig, 5 tab, 7 ref, 2 append.

Descriptors: *Spillways, *Boundary layers, *Design criteria, *Aeration, Hydraulics, Open channel flow, Flow control, Analytical technique, Analysis, Dimensional analysis, Theoretical analysis, Mathematical models, Flow, Chutes, Numerical analysis, Equations, Charts, Aerated flow.

On the basis of numerical solutions of the time-averaged Navier-Stokes equations and a simple dimensional analysis, design charts were presented for predicting the critical point where self-aeration first appears on overflow spillways. Synthetic data covering a wide range of possible spillway flow situations were fed into a previously developed and verified theoretical model. The results were presented in terms of generalized design variables using dimensional analysis. The design charts are applicable only to the WES spillway shape with vertical upstream face. Extension of the charts to other spillway shapes must await model testing to determine upper nappe profiles, discharge coefficients, and crest pressure characteristics. (Humphreys-ISWS)
W78-04521

DRAIN DISCHARGE FROM A LEVEL AGRICULTURAL WATERSHED,
Guelph Univ. (Ontario). School of Engineering.
For primary bibliographic entry see Field 4D.
W78-04522

ON THE TIME TO FIRST OVERFLOW IN DAMS WITH INPUTS FORMING A MARKOV CHAIN,
Stanford Univ., CA. Dept. of Operations Research.
D. P. Kennedy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 464, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 40, August 1976. 13 p, 3 ref. Prepared for Office of Naval Research, Washington, D.C. ONR N00014-76-C-0578.

Descriptors: *Dams, *Markov processes, Water demand, *Methodology, Statistical models, Overflow, Analytical techniques, Storage, Probability, Equations, *Joint distribution, Finite dam, State space, Transitional probabilities.

The joint distribution of the cumulative unsatisfied demand and time to the first overflow was investigated for a finite dam. The net input in each period was considered a function of a Markov chain. The probability of overflow before the unsatisfied demand exceeds a fixed level also was considered. Three examples were given to illustrate the use of the methodology developed. (Singh-ISWS)
W78-04535

WORKING PARTY ON THE HYDRAULIC DESIGN OF STORM SEWERS.
Chartered Municipal Engineer, Vol 104, No 10, p 189-190, October, 1977.

Descriptors: *Storm drains, *Hydraulic design, *Sewerage, *Rainfall, *Model studies, Computer programs, Analytical techniques, Publications, Cloudbursts, Winds, Municipal wastes, Waste water disposal.

New procedures for designing storm sewers and a design practice manual are being developed. The Working Party on the Hydraulic Design of Storm Sewers in England came into existence in March 1974. A pilot study found no systematic relationship between movement of intense rainfall and winds. Computer programs are being developed to simulate the hydraulic behavior of storm sewer systems. The improved design methods will probably include means of choosing appropriate values for rainfall data for calculation of the peak discharge for a required return period. More realistic modelling of above-ground hydrology and storm water flow in the sewer system is being developed. The design practice manual is expected to be available in 1979. The working party maintains communication with other organizations involved in setting standards for sewer design. (Snyder-FIRL)
W78-04551

EVALUATION OF STORM WATER ROUTEING MODELS,
MacLaren (James F.) Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5G.
W78-04554

FIXED-GRID CHARACTERISTIC FOR PIPELINE TRANSIENTS,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
D. C. Wiggert, and M. J. Sundquist.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 103, No HY12, p 1403-1416, December, 1977. 8 fig, 8 ref, append.

Descriptors: *Pipelines, *Conduits, *Internal waves, *Attenuation, *Dispersion, Flow, Fluctuations, Waste water treatment, Municipal wastes, Sewerage.

A method for the prediction of pipeline transients in closed waste water lines which involves the use of a general linear interpolation in conjunction with the method of characteristics technique and a rectangular grid has been developed. The variations of numerical attenuation and dispersion with respect to interpolation, spacing, and grid size were calculated through error analysis. The error analysis indicated that maximization of both the interpolation parameters and the number of spatial intervals for interpolation effectively reduced the numerical attenuation and dispersion. Results also showed that interpolation parameters should be maintained near unity and the number of spacial intervals for interpolation increased to more than one when applied to systems with constant wave speed and no friction factors. The method of characteristics interpolation technique was used to predict pipeline transients in hypothetical systems under conditions of constant wave speed, variable wave speed, and severe wave speed fluctuations. (Lisk-FIRL)
W78-04559

INTERACTIVE COMPUTER DESIGN OF WASTEWATER PLANTS,
Herkenhoff (Grodon) and Associates, Inc., Albuquerque, NM.
For primary bibliographic entry see Field 7C.
W78-04626

ACTIVATED SLUDGE-UNIFIED SYSTEM DESIGN AND OPERATION,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W78-04630

8C. Hydraulic Machinery

UNBALANCED DRILL COLLAR INCREASES PENETRATION RATES.
World Oil, Vol 186, No 1, p 103-105, January, 1978. 3 fig, 1 tab, 1 ref.

Descriptors: *Rotary drilling, *Drilling equipment, Oil industry, Wells, *Drill collars, *Penetration rate.

An eccentrically weighted drill collar that induces a low-frequency vibration in the drill string has allowed a Kansas drilling contractor to increase penetration rates by almost twenty-five percent without increasing the number of bits used, the number of connection failures, the average indicated bit weight, or the total revolutions. The collar appears to have lengthened bit life, and because the overall number of revolutions are reduced, rig maintenance is decreased, resulting in substantial savings. The collar also provides better hole conditions such as increased ease in running casing, better cement jobs, and in-gauge holes. The collar is primarily utilized to control deviation, because it transmits throughout the collarstring a low-intensity, once-per-revolution vibration every time the heavy side of the longitudinally unbalanced collar approaches the downward side of the hole, which helps to break sidewall friction and place more collar-string weight on the bit. Since the bit produces more consistent penetration rates, planning for future holes is facilitated. The collar can also eliminate the need for a shock sub. (Palmer-NWWA)
W78-04287

MAINTAINING YOUR WATER WELL DRILL.
Ground Water Age, Vol 12, No 3, p 20+, January, 1978.

Descriptors: *Drilling equipment, Water wells, Rotary drilling, Maintenance, Operating costs, *Percussion drilling, Wire rope.

A water well drill operates better and lasts longer when properly maintained. Rig maintenance should include care of the body to prevent rust or other corrosion and damage, lubrication of all moving parts, and thorough servicing of the engine and drive mechanisms. Wire rope, in particular, is subject to wear, so steps are suggested for its use and handling, and for storing it. Worn rope should be handled with extreme care until it can be replaced. Clips should also be attached according to outlined procedures to prevent strain or failure. (Palmer-NWWA)
W78-04288

COMPUTER AIDS DESIGN OF PRESSURE STORAGE TANKS,
R. A. Sterling.
Water and Sewage Works, Vol. 125, No. 1, p 80-81, January, 1978. 2 tabs.

Descriptors: *Pressure tanks, *Hydropneumatic tanks, *Computer programs, Design, Specifications, Pumping, Pressure.

Pressure or hydropneumatic tanks make delivery of water possible within a selected pressure range, without the necessity of operating pumps continuously or having the pumps cut in with every call for water on the distribution system. To assist in the design of pressure storage tanks for small water supply systems a computer prograh has been developed, written in BASIC and utilizing a Wand System 2200. The parameters which must be taken into account in the design of a pressure tank are: (1) pressure range; (2) pumping rate; (3) adequate water seal over tank outlets, and; (4) pumping cycles per hour. The tank selected must, of course, have dimensions that are commerically available. If the tank size is computed via this particular program, the design compromises with the nearest commercially available tank will usually be negligible. A sample of computer output and the full text of the program are given in this article. (Eberle-NWWA)
W78-04298

NEW MEXICO PUMP STUDY POINTS TO FARMERS' NEED FOR EFFICIENCY KNOWLEDGE,
For primary bibliographic entry see Field 3F.
W78-04300

BRINE CHEMISTRY, SCALING AND CORROSION: GEOTHERMAL RESEARCH STUDY IN THE SALTON SEA REGION OF CALIFORNIA,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 8G.
W78-04303

TRENCH CUTTER FOR EXCAVATING TRENCHES AND FOR LAYING WATER PIPES AND DRAINAGE PIPES,
Firma Klaus-Gerd Hoes, Oldenburg (West Germany).
K. G. Hoes, and G. Wobken.
U.S. Patent No. 4,043,135, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1497, August 23, 1977.

Descriptors: *Patents, *Pipelines, *Trenches, *Excavation, Engineering structures, Drainage systems, Water distribution(Applied).

A trench cutter for excavating trenches and for laying water pipes and drainage pipes into trenches consists of a travelling cutter chain with a jib supporting the cutter chain, the jib being pivotable in a vertical plane. A pipe laying duct is included for entering the excavation and sliding on the bottom of the excavation trench, the laying duct being pivotably connected to the job. A duct guide arm extends parallel to the back surface of the pipelaying duct for supporting the duct vertically so that it faces the cutter chain. Parallel guide rollers have one end pivotably connected to the duct guide arm and their opposite end connected to the outward drive shaft of the trench cutter. The drive shaft is pivotably connected to the free end of the jib. Guide rod linkages are connected to at least one work cyliner in order to adjust the angle of inclination between the cutter chain and the duct to change the clearance between the duct and the chain so that the duct can describe a curved path to permit the lower edge of the duct to be substantially tangential to the outer turning radius of the lower cutter chain. (Sinha-OEIS)
W78-04309

WATER WHEEL ASSEMBLY,
L. Gotti.
U.S. Patent No. 4,043,702, 5 p, 4 fig, 18 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1687, August 23, 1977.

Descriptors: *Patents, *Water wheels, Engineering structures, Hydroelectric power, Gravity, Railroad car wheels.

There is a need for a water wheel assembly which utilizes both the pressure generated from an elevated water supply and the force of gravity on one quarter of the water wheel, and is supported other than by the central axle so that the power take-off linkage is separated from the support bearings which are rotationally mounted in a stationary base. These bearings preferably are the wheels of railroad cars. Generally radially extended paddle elements placed between side walls and extending from their periphery includes an upward extended chute which is connected to an elevated water supply. This chute has a lower end shaped to deflect water generally horizontally and tangentially into the upper portion of the water

wheel and against the paddle elements. (Sinha - OEIS)
W78-04312

OPTIMIZATION OF AN OCEAN THERMAL ENERGY CONVERSION SYSTEM,
Swarthmore Coll., PA. Dept. of Engineering.
H. S. Dunn.
Ocean Engineering, Vol. 4, No. 1, p 23-39, March 1977. 3 fig, 2 tab, 5 ref.

Descriptors: *Sea water, *Thermal energy, *Optimization, *Conversion plants, Water temperature, Heat transfer, Rankine cycle, Linear term, Net power, Gross power output, Water supply, Ocean depths, Ammonia, Pumping, Design, Mathematical models, Equations, Systems analysis.

The optimum performance of a simple Rankine cycle ocean thermal energy conversion plant is investigated analytically. It is shown that the ratio of maximum net power output to heat exchanger surface area varies as H(Delta t - t sub 0) where H describes the overall heat transfer properties of the evaporator and condenser, delta t is the temperature difference between the warm and cold sea water supplies, and t sub 0 is a parameter depending primarily upon the pressure drops across the warm and cold sea water pumping systems. The model is relatively insensitive to the choice of working fluid, although ammonia is used as the illustrative example. (Bell-Cornell)
W78-04474

STORM SEWAGE OVERFLOWS,
Liverpool City Council (England). Dept. of the City Engineer.
P. R. Tottill.
Chartered Municipal Engineer, Vol. 104, No. 10, p 181-186, October, 1977. 6 fig, 18 ref.

Descriptors: *Storm water, *Overflow, *Combined sewers, *High flow, *Sewerage, Sewage, Storms, Municipal wastes, Analytical techniques, Waste water disposal.

Because flow in combined sewers can increase by 50 times during wet weather, it is frequently necessary to use a storm overflow chamber to decrease the load on sewers further downstream. Available storm overflow chambers include the high side weir, the stilling pond, and vortex overflows. Most research and development has been concentrated on improving conventional types of overflow treatment equipment. Some more recent developments show promise, but are relatively untried. The normal choice will be either a stilling pond or a high side weir with provisions for storage. Further research on the vortex overflow could produce an improved, more compact overflow chamber. Because small changes in an overflow chamber can affect performance considerably, model tests are important in designing an overflow chamber. The re-establishment of a technical committee to review research conducted since 1971 is recommended. (Snyder-FIRL)
W78-04550

NEW PORTOBELLO OUTFALL, BRIGHTON.
For primary bibliographic entry see Field 5E.
W78-04561

SYKES HANDLE PUMPEX SUBMERSIBLES.
Water and Waste Treatment, Vol. 20, No. 10, p 7, October, 1977.

Descriptors: *Pumps, *Waste water treatment, *Treatment facilities, *Drainage engineering, *Pumping plants, Sanitary engineering, Solid wastes, Equipment, Design data, Liquid wastes.

Pumpex AB of Sweden is producing a line of submersible drainage and sewage pumps. Six sizes of drainage pumps are available with 15 different versions capable of outputs of 70-840 gpm. Two of the models have torque flow impellers and are specifically designed for pumping solids in waste water. Drainage pumps suited to restricted access areas, such as deep wells and narrow trenches, are produced with overall diameters of 11-1/4 inches. A wide variety of sewage pumps for treatment plants and main drainage systems are produced by Pumpex. The sewage pumps have interchangeable components, allowing for many variations. The sewage pumps handle a capacity from 2100 gpm, when equipped with single channel impellers, and up to 1210 gpm with torque flow models. (Lisk-FIRL)
W78-04587

MAINE WASTEWATER TREATMENT PLANT OPTS FOR SOLAR HEATING.
For primary bibliographic entry see Field 5D.
W78-04640

8D. Soil Mechanics

FEASIBILITY STUDY FOR DYKE MARSH DEMONSTRATION AREA, POTOMAC RIVER, VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W78-04216

CAN TRENCH CAVE-IN DEATHS BE CUT.
Civil Engineering-ASCE, Vol 47, No 7, p 82-86, 1977. 1 ref.

Descriptors: *Sewers, *Design criteria, *Accidents, *Structural design, *Earth handling equipment, Reinforcement, Engineering structures, Construction materials, Pipelines.

Approximately 100 construction workers die annually because of trench cave-ins, primarily in sewer lines 5 to 20 feet deep. Most of these occur in excavations which are unshored. Careful study of the soils through which the trench will be cut and adequate engineering design are recommended. The major factor contributing to the high number of cave-ins is the lack of adequate engineering design and preplanning. Engineers should determine the nature of the soils to be encountered and design and specify the temporary support systems. Jurisdictions requiring that trench shoring be engineer-designed are noted. Thoughts from the insurance industry on trench cave-ins are presented. It is suggested that post-cave-in analyses of trench soil be conducted in efforts to learn as much as possible from actual accident scenes. (Baker-FIRL)
W78-04558

8G. Materials

NEW TUBULARS, STANDARDS DESIGNED FOR CORROSIVE SERVICE,
Armco Steel Corp., Houston, TX. National Supply Div.
R. L. Vingoe.
Oil and Gas Journal, Vol. 76, No. 4, p 58-62, January 23, 1978. 9 fig, 6 tab, 2 ref.

Descriptors: *Drill pipe, *Steel pipes, *Corrosion, Well casings, Heat treatment, Hydrogen sulfide, Failure(Mechanics), Cracking, Stress, Joints(Connections), *Corrosion control.

The worldwide search for energy has advanced into many areas where there is considerable concern over corrosion attack or stress corrosion cracking of casing, tubing, and drill pipe. The state of the art of tubular manufacture by American mills for corrosive environments is represented by the API L-80 grade casing and tubing. In the early 1970's, American mills made substantial progress in expanding heat treatment facilities. Ultimately, a new capability to provide quenched-and-tempered structure for corrosive environments was achieved. A resurgence of Modified N-80 tubular goods newly produced by Q and T methods led to the standardization of such products as API L-80. This new grade is currently meeting with growing customer acceptance and is showing good service performance. (Eberle-NWWA)
W78-04299

BRINE CHEMISTRY, SCALING AND CORROSION: GEOTHERMAL RESEARCH STUDY IN THE SALTON SEA REGION OF CALIFORNIA,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
M. R. Hoffmann.
EQL Memorandum No. 14, July, 1975. 48 p, 1 fig, 2 tab, 88 ref.

Descriptors: *Geothermal studies, *Geochemistry, *Brines, *Corrosion, *Scaling, *Salton Sea(California), Thermal water, Water analysis, Silica, Engineering, Projects, Documentation.

Exploitation of the vase energy resources of the Salton Sea Known Geothermal Area have been severely hampered by scaling and corrosion problems in wells and equipment. Silica scaling in particular has been the most troublesome of all geothermal difficulties encountered. Although there are indications that private industry has made important discoveries in alleviating such impediments to geothermal energy production, research reports to this effect have not yet been released for public inspection. In spite of this fact, this paper lists and comments upon available literature on geothermal scaling problems and surveys current research in brine chemistry and utilization. Guidelines for future research are presented. While the importance of brine analysis and laboratory test programs is noted, emphasis is also given to the viability of the pragmatic approach; the installation of equipment, analysis of failure at specific points, and the initiation of corrective procedures without previous extensive brine analysis may indeed be the quickest method of making thermal energy sources available. (Eberle-NWWA)
W78-04303

HYDRAULIC CONDUCTIVITY MEASUREMENTS UTILIZING HEAT-SHRINKABLE TUBING,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
D. R. Buss, B. D. Trexler, and W. A. Kneller.
Ground Water, Vol 16, No 1, p 49-50, January-February 1978. 2 fig, 1 ref.

Descriptors: *Hydraulic conductivity, *Laboratory tests, Equipment, Soils, Permeability, Permeameters, Analytical techniques, Groundwater, Groundwater movement, Geohydrology, *Heat-shrinkable tubing.

Hydraulic conductivity studies of a consolidated pozzolanic material indicated that heat-shrinkable tubing can be utilized to encase cylinders for use in a permeameter. The materials required for encasement of a sample include: heat-shrinkable tubing, hose clamps, polyvinyl chloride discs, glass tubing, and an electric oven. The procedure requires that the assembled PVC discs, filters, shrinkable tubing, and sample be placed on a support stand in an electric oven for 3 to 4 minutes at a temperature between 450-500 F. Upon removal from the oven, hose clamps are placed around each PVC disc. The method has several advantages: it saves time and money over conventional methods such as pneumatic pressurezed core holders or triaxial testing units, and it preserves the original interstitial bore spaces of the sample. (Sims-ISWS)
W78-04510

BAFFLED APRON AS SPILLWAY ENERGY DISSIPATOR,
Bureau of Reclamation, Denver, CO. Hydraulics Branch.
For primary bibliographic entry see Field 8B.
W78-04520

DEVELOPMENT OF LARGE ICE SAWS,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-04531

INTERNATIONAL PIPE PROTECTION CONFERENCE.
Corrosion Prevention and Control, Vol 24, No 5, p 2-4, October, 1977.

Descriptors: *Linings, *Pipes, *Concrete pipes, *Corrosion, *Construction materials, Sewers, Sewerage, Waste water treatment.

Highlights of the International Pipe Protection Conference held in 1977 at the University of Kent in Canterbury, England, are presented. Coating materials, pipe linings, sewer protection, erosion control, and electrochemical aspects of corrosion were discussed. The development of a new sewer material, sulfur-concrete, prefaced a discussion of methods of protecting concrete pipes in hot climates from attack by sulfuric acid formed in septic sewage. Solutions proposed include epoxy or coal tar-epoxy linings and glass-reinforced cement. Structural and non-structural lining of water mains was considered. At present, structural renovation techniques are limited to polyethylene pipe insertions and spray application of fiber-reinforced cement. Various techniques of corrosion control for water treatment systems were presented. (Baker-FIRL)
W78-04556

THE EFFECT OF TEMPERATURE CHANGE ON PLASTIC PIPE,
Naman (I. A.) and Associates, Los Angeles, CA.
H. Demergian.
Plumbing Engineer, Vol 5, No 6, p 27, 48-50, November-December, 1977. 3 fig, 1 tab, 6 ref.

Descriptors: *Plastic pipes, *Thermal stress, *Steel pipes, *Plastic deformation, *Stress analysis, Expansion joints, Construction materials, Flexibility, Rigidity, Elasticity, Thermal expansion, Sewers.

Properties of expansion and contraction of plastic pipe are compared with those of metal pipe under variations in temperature. When polyvinyl chloride (PVC) pipe is subjected to the same change in temperature as an equal length of steel pipe, the PVC pipe is five times more flexible than the steel under unobstructed conditions. Under rigid installation conditions, the PVC pipe is subject to less stress under thermal variations than the steel pipe. Piping installation should allow for combined stresses related to internal and external pressure, temperature changes, and the pipes' weight. Thermal contraction can be compensated for by snaking the pipe during installation. For rigid pipe, expansion joints or loops and changes in direction can be used. When expansion is anticipated, straight installation of plastic pipe can compensate for the thermal increase and consequent expansion. Thermal expansion coefficients are calculated for a number of other metal and plastic pipes. (Lisk-FIRL)
W78-04557

EPOXY COATED GRATING RESISTS CORROSION IN SEWAGE PLANT APPLICATION,
E. F. Kelly.
Water and Sewage Works, Vol 124, No 12, p 72, December, 1977.

Descriptors: *Treatment facilities, *Chemical wastes, *Sewerage, *Sewage treatment, *Corrosion control, Construction materials, Protective coatings, Municipal wastes, Epoxy resins, Industrial wastes, Equipment, Waste water treatment, Waste water disposal, Michigan.

A potential air contamination problem was presented by the combination of strong chemicals and sewage in waste water treatment and incineration plants located at the confluence of the Detroit and Rouge rivers. A self-ventilating plant was designed. Industrial steel grating was specified for much of the flooring of one of the incinerator complexes. A type of grating that offered the load strength of the regular product, in addition to corrosion resistance, was required. Ponbake epoxy-coated grating from Blaw-Knox Equipment, Inc., in Pittsburgh, Pennsylvania, was selected. Waste flows from residential, commercial, and industrial sources in Wayne, Oakland, and Macomb counties, as well as storm water from Detroit and some Detroit suburbs, are treated. Volumes sometimes exceed 1,000 mgd, but 800 mgd is typical. Ferrous chloride is used to bind phosphates into a settleable form. Coarse screens remove solid materials and grit settling polyelectrolyte addition, sedimentation and skimming, aeration, clarification, and chlorination. Treated effluent is discharged to the Detroit River; sludge is dewatered and transferred to 14 multiple hearth furnaces. The ash is transported to a landfill. The industrial grating at $3-5/sq ft was much less costly than conventional stee and concrete flooring. (Snyder-FIRL)
W78-04654

8I. Fisheries Engineering

ENTRAPMENT AND IMPINGEMENT OF FISHES BY POWER PLANT COOLING-WATER INTAKES: AN OVERVIEW,
California Univ., Davis. Div. of Wildlife and Fisheries Biology.
C. H. Hanson, J. R. White, and H. W. Li.
Marine Fisheries Review, Vol. 39, No. 10, October 1977, p 7-17, 3 fig, 1 tab, 52 ref.

Descriptors: *Environmental effects, *Powerplants, *Cooling water intakes, Fish passages, Engineering structures, Fish, Mortality, Design, Reviews, *Entrapment(Fish), *Impingement(Fish).

A discussion is presented on types of biological problems caused by intake structures, strengths and weaknesses of various water intake/fish protections sytems, and biological/ecological processes relevant to entrapment and inpingement problems. Water velocity, impingement time and physiological stress are considered as they relate to mortality caused by impingement. It was concluded that two major issues need to be addressed in future research: (1) what effect, if any, does entrapment/impingement have on the productivity of the ecosystem or resources; and (2) what criteria determine the best intake-design technologies for minimizing effects on the system. (Chilton-ORNL)
W78-04661

AQUATIC EFFECTS OF STEAM-ELECTRIC GENERATING PLANTS: FEDERAL REGULATIONS AND POSSIBLE IMPACTS ON MULTIPURPOSE RESERVOIRS IN OKLAHOMA,
Texas Instruments Inc., Dallas. Ecological Services.
For primary bibliographic entry see Field 5C.
W78-04668

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

NWWA RESEARCH FACILITY: AN OVERVIEW.
For primary bibliographic entry see Field 4B.
W78-04289

10. SCIENTIFIC AND TECHNICAL INFORMATION

10D. Specialized Information Center Services

NWWA RESEARCH FACILITY: AN OVERVIEW.
For primary bibliographic entry see Field 4B.
W78-04289

STATE-OF-THE-ART SURVEY AND EVALUATION OF OPEN-WATER DREDGED MATERIAL PLACEMENT METHODOLOGY,
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 05E.
W78-04533

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W78-04276 5D

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Brine Chemistry, Scaling and Corrosion: Geothermal Research Study in the Salton Sea Region of California,
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The Comparison of Sludge Extracts and Chu 10 in Cultivating Chlorella Pyrenoidosa,
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Applications for South Carolina's Wetlands of a General Model of Efficient Solutions to Externalities,
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An Application of Interactive Multiobjective Water Resources Planning,
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The Determination of Regional Evapotranspiration by Means of Standard Meteorological Data,
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Evaluating Wastewater Facility Staffing Needs,
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DEPARTMENT OF COMMERCE, WASHINGTON, DC. OFFICE OF ENVIRONMENTAL AFFAIRS.
Controlling the Entrance of Toxic Pollutants into U.S. Waters,
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Wastewater User Charges and Industrial Cost Recovery: Guidelines and Examples,
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Impact of Community Planning on Quality of Life in the North,
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Water Quality Surveys on the Niagara River - 1974,
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DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WASTEWATER TECHNOLOGY CENTRE.
Reliability of Nitrification Systems with Integrated Phosphorus Precipitation,
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W78-04354 5D

Chemical Sewage Sludge Disposal on Land (Lysimeter Studies) Volume 1,
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DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER QUALITY BRANCH.
Surface Water Quality in Canada - An Overview.
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Nitrilotriacetic Acid (NTA) In the Canadian Environment,
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DEPARTMENT OF THE ENVIRONMENT, OTTAWA, (ONTARIO). WATER RESOURCES BRANCH.
Streamflow Regionalization in British Columbia, No. 3, Statistics of Mean Annual Flow,
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Simultaneous Production of Multiple Grades of Purified Water by Reverse Osmosis,
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Agrometeorological Studies in the Turkmen SSR, (In Russian),
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A Waste Stream Management System,
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Chemical Treatment as a Cost-Effective Alternative for Wastewater Treatment: Operating vs. Capital Costs,
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Removal of Zn or Cd and Cyanide from Cyanide Electroplating Wastes,
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ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, NC. OFFICE OF RESEARCH AND DEVELOPMENT.
Scientific and Technical Assessment Report on Nitrosamines.
W78-04659 5C

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC.
Energy from the West: A Progress Report of a Technology Assessment of Western Energy Resource Development.
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ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN ARBOR. INFRARED AND OPTICS DIV.
An ERTS-1 Investigation for Lake Ontario and Its Basin,
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FARBENFABRIKEN BAYER A. G., LEVERKUSEN (WEST GERMANY). PHYSIOLOGISCHES CHEMIE ANALYTISCHES LAB.
The Determination of Vanadium in Aqueous Solutions, Air and Biological Material: 1. The Determination of Vanadium in Aqueous Solutions, (In German),
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FIRMA KLAUS-GERD HOES, OLDENBURG (WEST GERMANY).
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Unusual Response of a Cupric Ion Electrode in Prairie Lake Waters,
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FLORIDA STATE DEPT. OF ENVIRONMENTAL REGULATION, TALLAHASSEE.
Hydrologic Considerations of the Upper St. Johns River Basin, Florida,
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Soil Water Flow and Distribution in Horizontal and Vertical Directions as Influenced by Intermittent Water Application,
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GEOLOGICAL SURVEY, BATON ROUGE, LA. WATER RESOURCES DIV.
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Water-Level Changes in the Northern High Plains of Colorado, 1964 to 1976 and 1972 to 1976,
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GEOLOGICAL SURVEY, LUGUNA NIGUEL, CA. WATER RESOURCES DIV.
Summary of Basic Hydrologic Data Collected at Coso Hot Springs, Inyo County, California,
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Trace Metal Content of Bottom Sediment in Northern Bering Sea,
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Mercury Dispersal from Lode Sources in the Kuskokwim River Drainage, Alaska,
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GEOLOGICAL SURVEY, MENLO PARK, CA. WATER RESOURCES DIV.
Water Resources Data for California, Water Year 1976--Volume 1. Colorado River Basin, Southern Great Basin from Mexican Border to Mono Lake Basin, and Pacific Slope Basins from Tijuana River to Santa Maria River.
W78-04266 7C

Water Resources Data for California, Water Year 1976u-Volume 4. Northern Central Valley Basins and the Great Basin from Honey Lake Basin to Oregon State Line.
W78-04267 7C

Water Resources Data for California, Water Year 1976--Volume 3. Southern Central Valley Basins and the Great Basin from Walker River to Truckee River.
W78-04268 7C

Water Resources Data for California, Water Year 1976--Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley.
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GEOLOGICAL SURVEY, MINEOLA, NY. WATER RESOURCES DIV.
Geochemical Effects of Recharging the Magothy Aquifer, Bay Park, New York, with Tertiary-Treated Sewage,
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Ground-Water Levels in the United States, 1973-74. Northeastern States.
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Conservation of Water, Chemicals, and Energy in Dyeing Nylon Carpet,
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Utilization of Chitosan for Recovery of Coagulated By-Products from Food Processing Wastes and Treatment Systems,
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Gravelly Flood Deposits of Irvine Creek, Ontario, Canada,
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GUELPH UNIV. (ONTARIO). SCHOOL OF ENGINEERING.
Drain Discharge from a Level Agricultural Watershed,
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Effects of Mercury and Tin on Frustular Ultrastructure of the Marine Diatom, Nitzschia Liebethrutti,
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HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
The Eutrophic Potential of Wahiawa Reservoir Sediments,
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HEALTH EFFECTS RESEARCH LAB., CINCINNATI, OH.
Disinfection of Drinking Water, Swimming-Pool Water and Treated Sewage Effluents,
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HEALTH EFFECTS RESEARCH LAB., RESEARCH TRIANGLE PARK, NC. CHEMISTRY AND PHYSICS LAB.
Long Path Optical Measurement of Atmospheric Pollutants,
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Clarification Plant,
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HERKENHOFF (GRODON) AND ASSOCIATES, INC., ALBUQUERQUE, NM.
Interactive Computer Design of Wastewater Plants,
W78-04626 7C

HILO COAST PROCESSING CO., PEPEEKEO, HI.
A Progress Report on a Systems Approach to Effluent Abatement in Hawaii,
W78-04422 5D

HIROSHIMA UNIV. (JAPAN). DEPT. OF FERMENTATION TECHNOLOGY.
Determination of Sludge Yield and the Sludge Decomposition Coefficient in Activated Sludge Treatment of Waste Water from Soybean Curd Manufacture, (In Japanese),
W78-04276 5D

HITTMAN ASSOCIATES, INC., COLUMBIA, MD.
Effectiveness of Surface Mine Sedimentation Ponds,
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HYOGO PREFECTURE ENVIRONMENTAL SCIENCE INST., KOBE (JAPAN).
Adaptation of Activated Sludge for Cyanide, (In Japanese),
W78-04375 5D

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Reverse Osmosis Provides Reusable Water From Electronics Waste,
W78-04400 5D

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Alteration of Crude Oil by Waters and Bacteria: Evidence from Geochemical and Isotope Studies,
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INDUSTRIAL ENVIRONMENTAL RESEARCH LAB.-CINCINNATI, CORVALLIS, OR. CORVALLIS FIELD STATION.
Meatpacking Wastewater Treatment by Spray Runoff Irrigation,
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INSTITUT FEDERAL POUR L'AMENAGEMENT, L'EPURATION ET LA PROTECTION DES EAUX, ZURICH (SWITZERLAND).
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INSTITUT FUER AGRIKULTURCHEMIE, GOETTINGEN (WEST GERMANY).
Precipitated Waste Water Phosphorus Fertilizers (Abwasserphosphate als Duengemittel),
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INSTITUT RUDJER BOSKOVIC, ROVINJ (YUGOSLAVIA). CENTER FOR MARINE RESEARCH.
The Interaction of DDT With Suspended Particles in Sea Water,
W78-04676 5B

INTERNATIONAL INST. FOR APPLIED SYSTEMS ANALYSIS, LAXENBURG (AUSTRIA).
Environmental Problems of India and Their Possible Trends in Future,
W78-04643 5G

INTERNATIONAL INST. FOR APPLIED SYSTEMS ANALYSIS, LAXENBURG (AUSTRIA).

INTERNATIONAL JOINT COMMISSION-UNITED STATES AND CANADA. GREAT LAKES REGIONAL OFFICE.
The Great Lakes Cleanup,
W78-04586 5G

INTERNATIONAL REFERENCE CENTER FOR COMMUNITY WATER SUPPLY, LEIDSCHENDAM (NETHERLANDS).
The International Cooperation in Studying the Health Aspects of Organic Contaminants in Indirectly Reused Waste Water,
W78-04305 5D

IRKUTSKII GOSUDARSTVENNYI UNIV. (USSR). SCIENTIFIC RESEARCH INST. OF BIOLOGY.
The Cyclicity of the Process of Changes in the Biomass of Lake Baikal Zooplankton Over Many Years, (In Russian),
W78-04212 5C

ISHIGAKI KIKO CO., TOKYO (JAPAN). (ASSIGNEE).
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